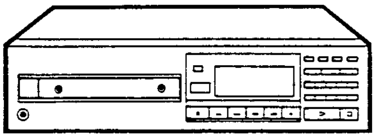
PIONEER
The future of sound and vision.

Service Manual



ORDER NO.
ARP1549

COMPACT DISC PLAYER

PD-X540

MODEL PD-X540 HAS TWO VERSIONS:

Type	Power requirement	Export destination
HEM	AC220V, 240V (Switchable) *	European continent
HB	AC220V, 240V (Switchable) *	United Kingdom

* Change the connection wire from Power switch board assembly to Transformer board assembly.

- **This manual is applicable to the HEM and HB types.**
- **For the HB type, refer to page 78.**
- **Ce manuel pour le service comprend les explications en français de réglage.**
- **Este manual de servicio trata del método ajuste escrito en español.**

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1. SAFETY INFORMATION

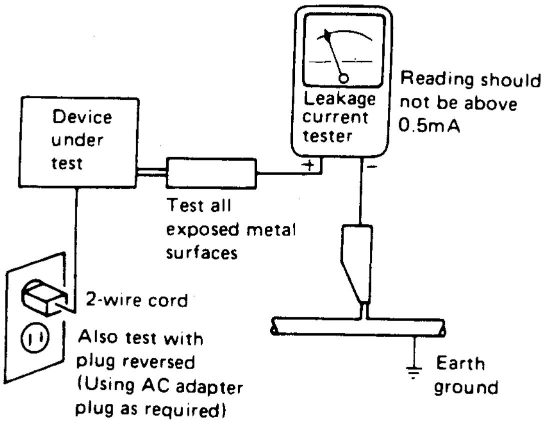
(FOR USA MODEL ONLY)

1. SAFETY PRECAUTIONS

The following check should be performed for the continued protection of the customer and service technician.

LEAKAGE CURRENT CHECK

Measure leakage current to a known earth ground (water pipe, conduit, etc.) by connecting a leakage current tester such as Simpson Model 229-2 or equivalent between the earth ground and all exposed metal parts of the appliance (input/output terminals, screwheads, metal overlays, control shaft, etc.). Plug the AC line cord of the appliance directly into a 120V AC 60Hz outlet and turn the AC power switch on. Any current measured must not exceed 0.5mA.


Device under test
Leakage current tester
Reading should not be above 0.5mA
+
−
Test all exposed metal surfaces
2-wire cord
Also test with plug reversed (Using AC adapter plug as required)
Earth ground

AC Leakage Test

ANY MEASUREMENTS NOT WITHIN THE LIMITS OUTLINED ABOVE ARE INDICATIVE OF A POTENTIAL SHOCK HAZARD AND MUST BE CORRECTED BEFORE RETURNING THE APPLIANCE TO THE CUSTOMER.

2. PRODUCT SAFETY NOTICE

Many electrical and mechanical parts in the appliance have special safety related characteristics. These are often not evident from visual inspection nor the protection afforded by them necessarily can be obtained by using replacement components rated for voltage, wattage, etc. Replacement parts which have these special safety characteristics are identified in this Service Manual.

Electrical components having such features are identified by marking with a ⚠ on the schematics and on the parts list in this Service Manual.

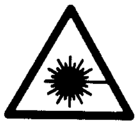
The use of a substitute replacement component which does not have the same safety characteristics as the PIONEER recommended replacement one, shown in the parts list in this Service Manual, may create shock, fire, or other hazards.

Product Safety is continuously under review and new instructions are issued from time to time. For the latest information, always consult the current PIONEER Service Manual. A subscription to, or additional copies of, PIONEER Service Manual may be obtained at a nominal charge from PIONEER.

(FOR EUROPEAN MODEL ONLY)

VAROITUS!

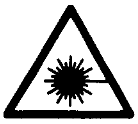
LAITE SISALTAA LASERDIODIN, JOKA LAHETTAA NAKYMATONTA, SILMILLE VAARALLISTA INFRAPUNASATEILYA LAITTEEN SISALLA ON LASERDIODIN LAHEISYYDESSA KUVAN 1. MUKAINEN VAROITUSMERKKI.



LASER
Kuva 1
Lasersateilyn varoitusmerkki

WARNING!

DEVICE INCLUDES LASER DIODE WHICH EMITS INVISIBLE INFRARED RADIATION WHICH IS DANGEROUS TO EYES. THERE IS A WARNING SIGN ACCORDING TO PICTURE 1 INSIDE THE DEVICE CLOSE TO THE LASER DIODE.



LASER
Picture 1
Warning sign for laser radiation

ADVERSEL:

USYNLIG LASERSTRÅLING VED ÅBNING NÅR SIKKERHEDSAFBRYDERE ER UDE AF FUNKTION UNDGÅ UDSAETTELSE FOR STRÅLING.

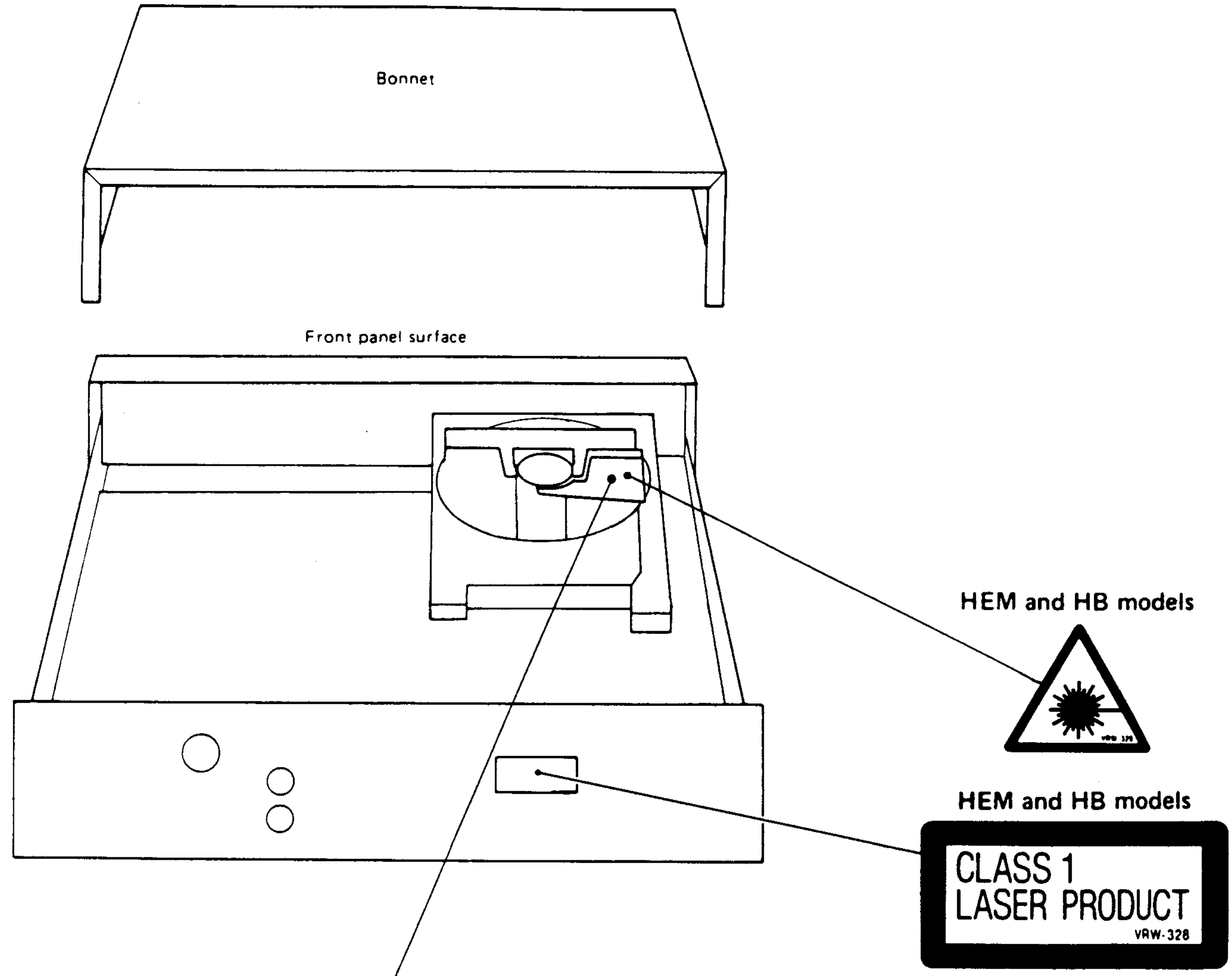
IMPORTANT

PIONEER COMPACT DISC PLAYER APPARATUS CONTAINS LASER OF HIGHER CLASS THAN 1. SERVICING OPERATION OF THE APPARATUS SHOULD BE DONE BY A SPECIALLY INSTRUCTED PERSON.

VIKTIGT

APARATEN INNEHÅLLER LASER AV HÖGRE KLASS ÄN 1. INGREPP I APPARATEN BÖR GÖRAS AV SPECIELLT UTBILDAD PERSONAL.

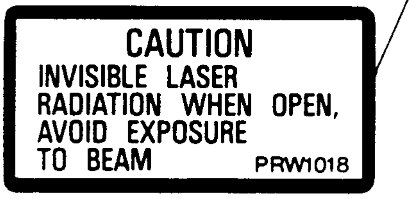
LABEL CHECK



HEM and HB models

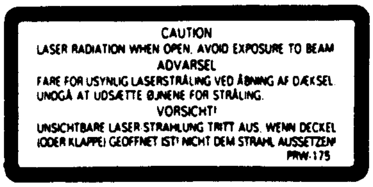
CLASS 1
LASER PRODUCT
VRW-328

HB model



CAUTION
INVISIBLE LASER
RADIATION WHEN OPEN,
AVOID EXPOSURE
TO BEAM
PRW1018

HEM model



CAUTION
LASER RADIATION WHEN OPEN. AVOID EXPOSURE TO BEAM
ADVARSEL
FARE FOR USYNLIG LASERSTRÅLING VED ÅBNING AF DÆKSEL.
UNDGÅ AT UDSÆTTE ØJNENE FOR STRÅLING.
VORSICHT!
UNSICHTBARE LASER-STRAHLUNG TRITT AUS, WENN DECKEL
(ODER KLAPPE) GEOFFNET IST! NICHT DEM STRAHL AUSSETZEN!
PRW-175

ADDITIONAL LASER PRECAUTIONS

1. Laser Interlock Mechanism

   The clamp switch (S102) detects the completion of the Load in operation, and the ON/OFF status of the clamp switch is in turn detected by the microcomputer. The laser diode is designed not to oscillate while the clamp switch is in OFF status.

   Consequently, if S102 is accidentally short-circuited, the interlock mechanism will become incapable of operation.

   Moreover, when short-circuiting occurs between Pins 4 or 5 of CXA1081S (IC 1) and GND, or between Pin 29 of CXA1081S (IC 1) and GND, or between the terminals of Q1 (a Fault Condition will occur in all three cases), the laser diode will oscillate continuously.

   Note that during TEST Mode (see page 32), the interlock mechanism does not operate.

2. While the bonnet is in opened status, if the pickup is positioned to allow direct visibility of the objective lens at the outer periphery from the outer diameter of the disc clamper (80-mm diameter), the pickup can be flooded with radiation of more than class 1 of the laser optical system during any Fault Condition in Item 1 above or during TEST Mode.

2. SPECIFICATIONS

1. General

Type	Compact disc digital audio system
Usable discs	Compact Disc
Signal format	Sampling frequency: 44.1kHz Quantized bit number: 16 bit linear
Power requirements	
European models	AC 220V, 50/60Hz
U.K., Australian models	AC 240V, 50/60Hz
U.S., Canadian models	AC 120V, 60Hz
Other models	AC 110/120–127/220/240V (switchable), 50/60Hz
Power consumption	16W
Operating temperature	+5°C – +35°C (+41°F – +95°F)
Weight	4.1kg (8lb, 13oz)
External dimensions	420(W) × 315(D) × 98(H)mm 16-9/16(W) × 12-7/16(D) × 3-7/8(H) in.

2. Audio section

Frequency response	4Hz–20kHz (±0.5dB) (EIAJ)
S/N	**102dB or more (EIAJ)**
Dynamic range	**95dB or more (EIAJ)**
Channel separation	**97dB or more (EIAJ)**
Total harmonic distortion	**0.004% or less (EIAJ)**
Output voltage	**2.0V±0.3V (EIAJ)**
Wow and flutter	Limit of measurement (±0.001% W.PEAK) or less (EIAJ)
Number of channels	2 channels (stereo)

3. Output terminal

Audio line output terminal
Headphone jack

4. Functions

- Play
- Pause
- Manual search
- Track search
- Direct track search
- One track repeat
- All track repeat
- Programmed repeat
- Programmed playback
- Pause program
- Add-on program
- Auto program editing
- Time fade editing
- Timer start
- One touch fade-in and fade-out

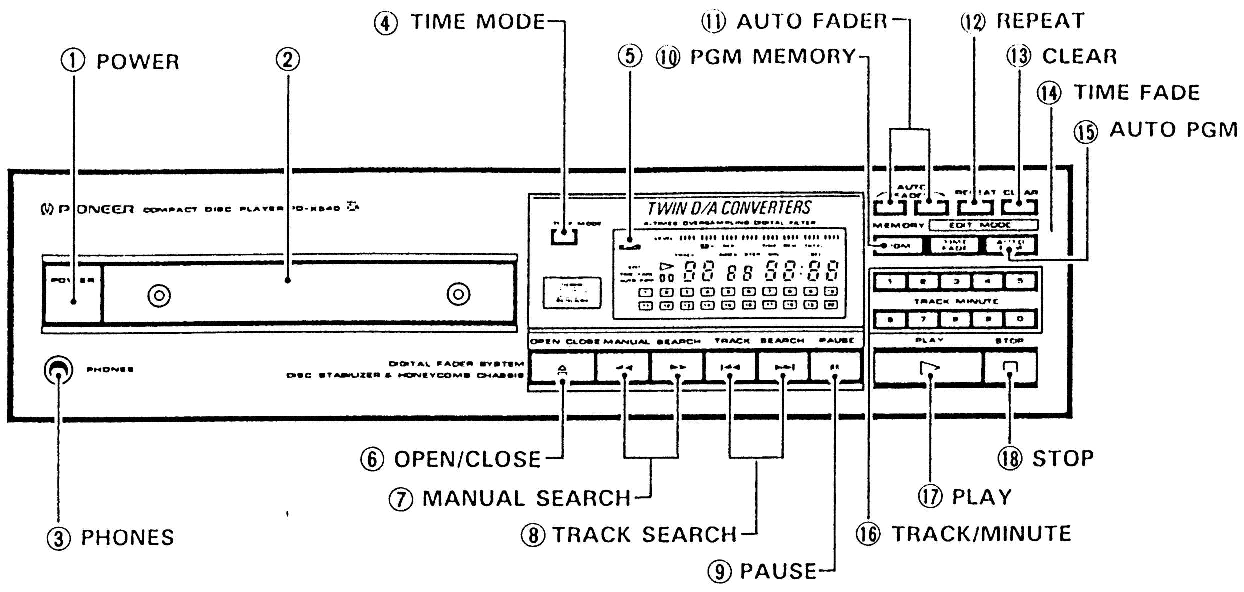
5. Accessories

● Output cable	1
● Remote control cord	1
● Operating instructions	1

NOTE:
The specifications and design of this product are subject to change without notice, due to improvements.

3. PANEL FACILITIES

FRONT PANEL



① POWER switch

Press to turn power to the unit ON and OFF.
If there is a disc in the unit when power is turned ON, playback will begin automatically. (Timer start function)

② Disc Tray

This is where the disc is set. When power is switched ON and the OPEN/CLOSE key is pressed, the tray is ejected forward. To insert the tray, press the OPEN/CLOSE key, or lightly push the tray in with your finger. With the disc tray open, pressing the PLAY key will close the disc tray and start playback.

③ PHONES (headphones) jack

When you wish to use headphones, insert the plug for the headphones into the headphone jack.

④ TIME MODE key

This key selects the display mode of the indicator panel. Each time the key is pressed, the indication changes from TIME, REMAIN, to TOTAL in that order. (For details concerning the display contents, refer to the explanation about the indicators.)
If pressed after pressing the track number key, the playback time of the selected track only is displayed.

⑤ Indicators

LEVEL	: The volume level of fade-in and fade-out is displayed.
PGM	: Lights after programming (after program has been memorized).
1▶ REP	: Lights during repeat playback of one track.
REP	: Lights during repeat playback.
TRACK 1 – 20 (Music calendar)	: Displays the current track number (during normal playback and programmed playback) or the track being programmed during programming operation. The lower figures light up in accordance with the number of tracks recorded on the disc, and the numbers of the tracks which have been played are deleted in order. (During programmed playback only the programmed tracks light.)
INDEX	: Displays the index * number of the music section of a track or the track division.
STEP	: Displays the program steps.
MIN (minute)	: Displays the minutes of the elapsed time, total playback time, and remaining time.
SEC (second)	: Displays the seconds of the elapsed time, total playback time, and remaining time.
TIME/REMAIN/TOTAL	: Changes each time the TIME key is pressed.
● TIME	: Displays the track number of the track being played (TRACK) and the elapsed time (minutes and seconds).
● REM	: Displays the remaining time on the track being played. When the TIME key is pressed again, the remaining time on the disc will be displayed.
● TOTAL	: Displays the total number of tracks on the disc (TRACK) and the overall playback time (minutes and seconds). During playback, the display goes on for about 5 seconds before changing to the TIME display.

Programmed playback operation displays the remaining time of the programmed tracks (REMAIN), and the total playback time (TOTAL).

TIME FADE EDIT	: Displays when Time Fade Editing is set or used.
AUTO PGM EDIT	: Displays when Auto Program Editing is set or used.

* The INDEX is a signal which is recorded within a track to indicate division of the track into separate tunes and items of music.

⑥ OPEN/CLOSE key (⏏)

Press when you wish to eject or load a disc. Each time the key is pressed, the tray is alternately pushed out or pulled in.

⑦ MANUAL SEARCH keys

When the player is in playback or pause modes, these keys are pressed to perform fast forward or reverse operations to allow manual searching. These operations are only carried out during the time either key is pressed.

[▶▶] : For fast forward operation. If the end of the disc is reached during fast forward operation, "End" will be displayed and the player will enter the pause mode. (During programmed playback, the player will enter the pause mode right before it reaches the next track (program step).)

[◀◀] : For fast reverse operation. If the beginning of the disc is reached during fast reverse operation, the player will enter the playback mode. (During programmed playback, the player will enter the playback mode right before it reaches the previous track (program step).)

⑧ TRACK SEARCH keys

During normal playback, programmed playback or pause modes, these keys are pressed to search for the desired track. Pressing either key causes the player to advance to the next track or to return to the previous track. Even in stop mode, these keys can be used to select the desired track. Press the PLAY key to playback the desired track.

[▶▶|] : When pressed once, playback advances to the beginning of the next track on the disc; when pressed continuously, playback advances to the beginning of succeeding tracks on the disc. (During programmed playback, it advances to the beginning of the next programmed track.)

[|◀◀] : When pressed once, playback returns to the beginning of the currently playing track; when pressed continuously, playback shifts to the beginning of previous tracks on the disc. (During programmed playback it returns to the beginning of the previous programmed track.)

⑨ PAUSE key (⏸)

Press to temporarily interrupt playback. When pressed again, the pause mode is cancelled and playback resumes.

⑩ PGM MEMORY key

Use to program a sequence of tracks.

- Press this key after selecting a desired track with the track number keys. Tracks will be added to the program in the order in which they are selected.

⑪ AUTO FADER keys

Auto fader-in (⟋)
: Press this key to start playback with fade-in sound. (Possible only in pause mode during playback.)

Auto fader-out (⟍)
: Press this key for fade-out sound. (After fade-out is completed, the unit will enter pause mode.)

⑫ REPEAT key

Press this key for repeat playback. Pressing the key once, twice, or three times will change the repeat mode from single track repeat, all tracks repeat, and repeat playback cancellation.
Single track repeat:
The currently-playing track will repeat. The key can be used during normal playback, program playback, random playback.
All tracks repeat:
All tracks on the disc will be repeated.

- If pressed during normal playback mode, all tracks on the disc will be repeatedly played back.
- If pressed during programmed playback, the programmed tracks will be repeatedly played back in the programmed order.
- In the case of random play mode, after all the tracks have been played, random play will start again.

⑬ CLEAR key

Press this key to clear the program.

⑭ TIME FADE key

Press this key to end playback at a desired time with fade-out.

⑮ AUTO PGM key

Press to program a tune which may be played back within a specified time.

⑯ TRACK/MINUTE keys (1 to 0)

- Use to specify track numbers (track 1 – track 99) for selection of tracks or program entry.
- Use to specify time (in minutes), during auto program editing and time fade editing.

⑰ PLAY key (▷)

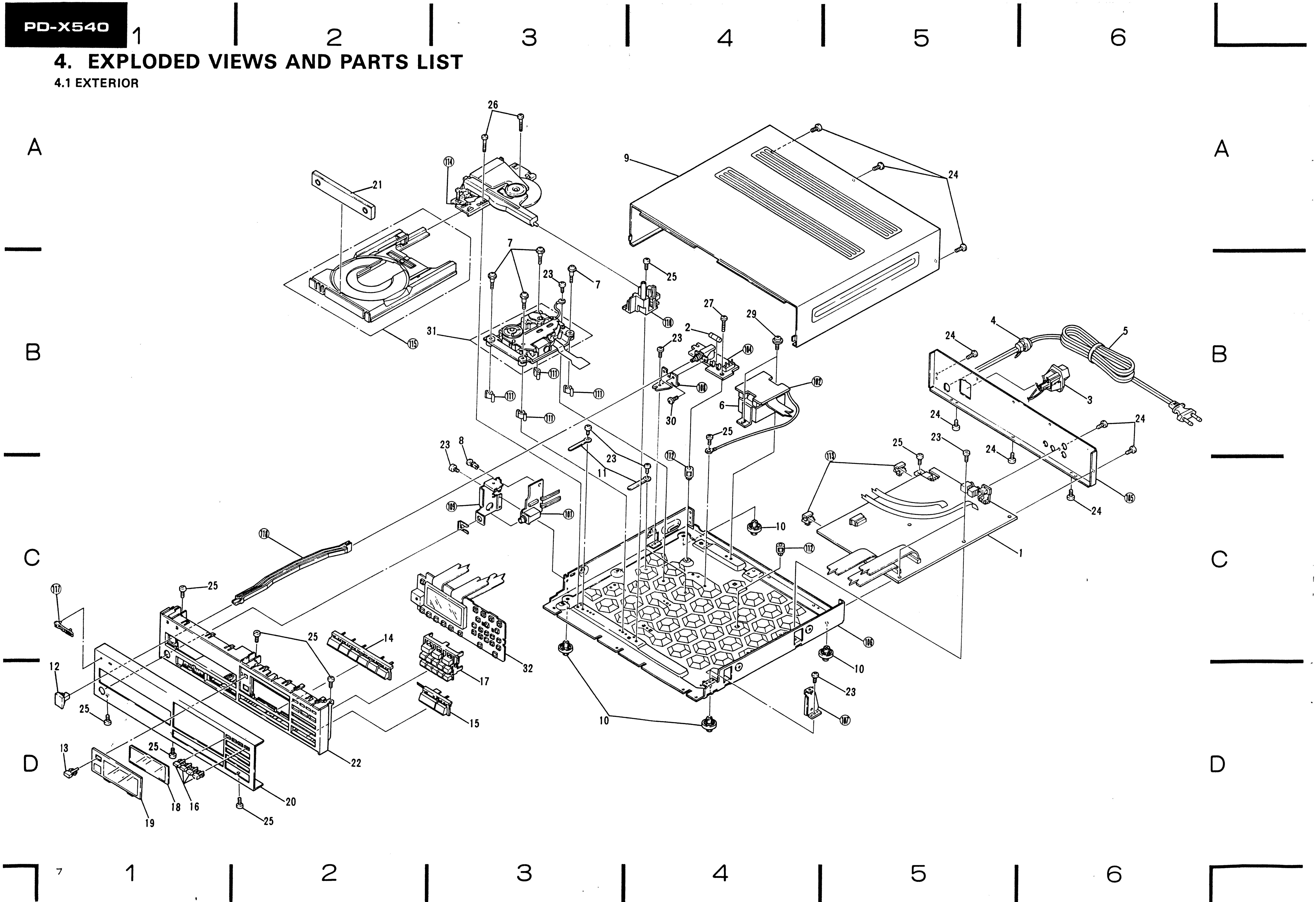
Press to begin playback, and to cancel the pause mode.

⑱ STOP key (□)

Press to stop playback. When pressed, the player goes into stop mode and all operations stop.

4. EXPLODED VIEWS AND PARTS LIST

4.1 EXTERIOR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32
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(106)
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(107)

NOTES:

- *Parts without part number cannot be supplied.*
- *The ⚠ mark found on some component parts indicates the importance of the safety factor of the part. Therefore, when replacing, be sure to use parts of identical designation.*
- *For your parts Stock Control, the fast moving items are indicated with the marks ★★ and ★.*
  ★★ GENERALLY MOVES FASTER THAN ★
  This classification shall be adjusted by each distributor because it depends on model number, temperature, humidity, etc.
- *Parts marked by "◉" are not always kept in stock. Their delivery time may be longer than usual or they may be unavailable.*

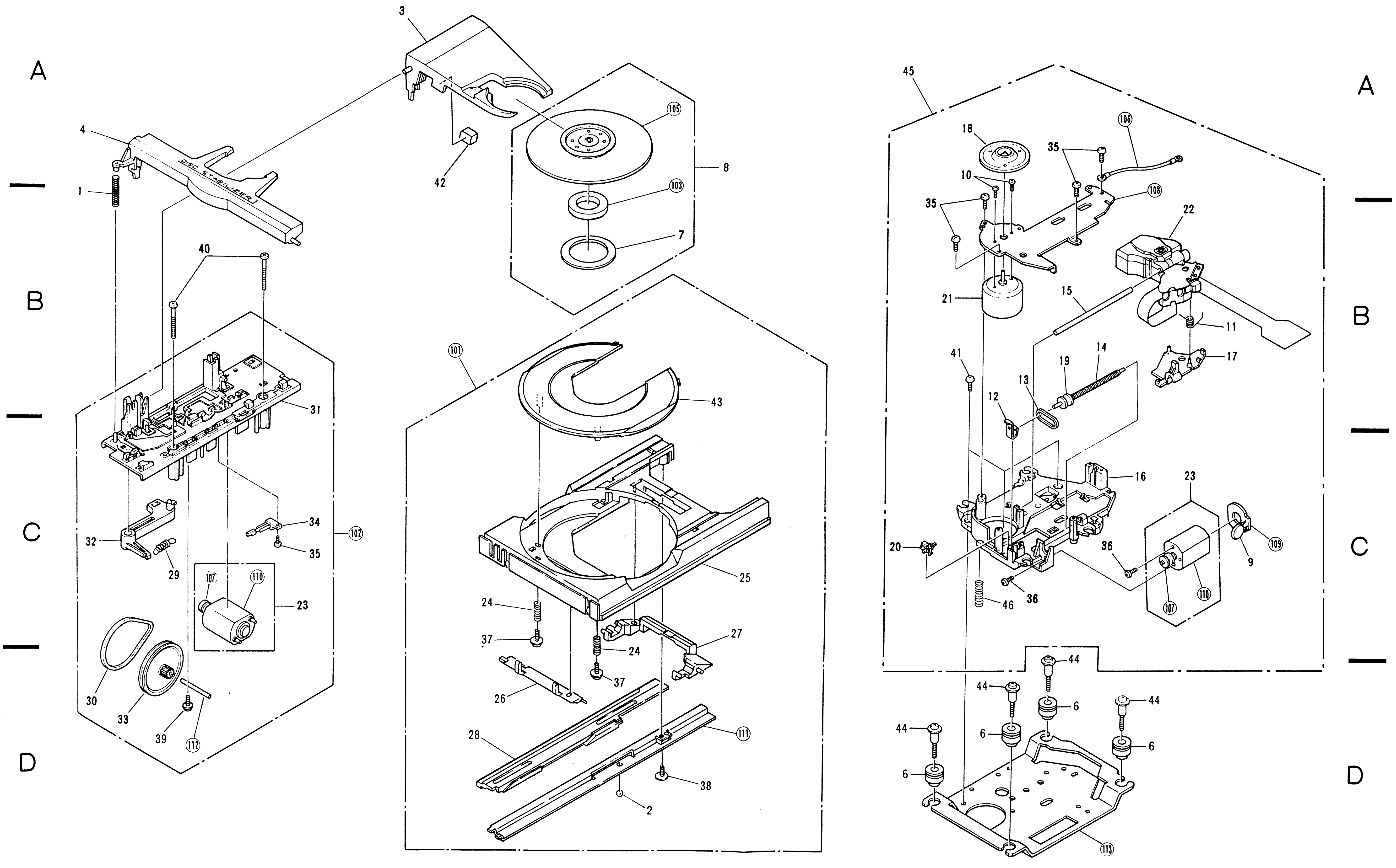
Parts List of Exterior

Mark	No.	Part No.	Description
⚠ ⊙	1	PWZ1444	Main board assembly
⚠ ★★	2	REK-103	Fuse (T2A)
⚠	3	AKP-508	1P AC outlet
⚠	4	CM-22B	Strain relief
⚠	5	PDG1008	AC power cord
⚠ ★	6	PTT1063	Power transformer (AC220/240V)
	7	PBA1001	Screw
	8	PBM-012	Plastic rivet
	9	PYY1054	Bonnet
	10	REC-434	Foot assembly
	11	RNH-184	Cord clamper
	12	PAC-408	Power button
	13	PAC1088	Time button
	14	PAC1147	Function button
	15	PAC1148	P/S button
	16	PAC1169	Fade button
	17	PAC1273	Mode button
	18	PAM1113	FL filter
	19	PAM1204	Acrylic window
	20	PAN1102	Front panel
	21	PNW1179	Plate
	22	PNW1180	Function panel
	23	BBZ30P060FMC	Screw
	24	BBZ30P080FCC	Screw
	25	BBZ30P080FZK	Screw
	26	BBZ30P230FMC	Screw
	27	BBZ30P160FMC	Screw
	29	IBZ40P080FCC	Screw
	30	PMZ30P060FCU	Screw
	31	PYY1063	Servo mechanism assembly
⊙	32	PWZ1447	Function board assembly
	101		Headphone board assembly
	102		Transformer board assembly
	103		.....
⚠	104		Switch board assembly
	105		Rear base
	106		Under base
	107		Angle
	108		Switch angle
	109		Angle L
	110		Slide guide
	111		Mechanism support
	112		PCB spacer
	113		P. plate holder
	114		Loading base assembly
	115		Tray assembly
	116		.....
	117		Name plate
	118		SW joint

Parts List of Mechanism Section

Mark	No.	Part No.	Description
	1	PBH1013	Spring
	2	PBP-001	Steel ball φ4
	3	PNW1084	Clamp holder
	4	PNW1085	Clamp retainer
	5	PBH1009	Spring
	6	PBE1031	Floating rubber
	7	PNM1010	Disc cushion
	8	PYY1028	Clamper assembly
	9	CGDYX104M25	Semiconductive ceramic capacitor
	10	PBA-209	Screw M2 x 3
	11	PBH1008	Drive spring
	12	PBK1010	Plate spring
★★	13	PEB1072	Belt (CARRIAGE)
	14	PLA1003	Drive worm
	15	PLA1004	Guide bar
	16	PNW1062	Mechanism chassis
	17	PNW1063	Carriage plate
	18	PNW1064	Disc table
	19	PNW1066	Pulley
★★	20	PSH1003	Slide switch (S101. INSIDE)
★★	21	PXM1001	Spindle motor
	22	PWY1003	Pick up assembly
★★	23	PYY1025	Motor assembly (CARRIAGE, LOADING)
	24	PBH1045	Plate Spring
	25	PNW1390	Tray
	26	PNW1330	Plate lever (F)
	27	PNW1331	Plate lever (R)
	28	PNW1332	Rack
	29	PBH 1012	Clamp spring
★★	30	PEB1013	Belt (LOADING)
	31	PNW1069	Loading base
	32	PNW1083	Clamp lever
	33	PNW1171	Gear pulley
★★	34	VSK-015	Leaf switch (S102.OPEN/CLAMP)
	35	BPZ20P080FZK	Screw
	36	PMZ20P030FMC	Screw
	37	PBA1025	Screw
	38	PPZ30P080FMC	Screw
	39	IPZ30P060FMC	Screw
	40	BBZ30P230FMC	Screw
	41	BBZ30P080FCC	Screw
	42	PEB1095	Stopper rubber
	43	PNW1329	Disc plate
	44	PBA1001	Screw
	45	PYY1063	Servo mechanism assembly
	46	PBH1009	Earth spring
	101		Tray assembly
	102		Loading base assembly
	103		Magnet
	104		Ballast base
	105		Clamper
	106		Earth lead wire unit
	107		Motor pulley
	108		Base plate
	109		Carriage M board
	110		Motor (LOADING, CARRIAGE)
	111		Slide base
	112		Gear shaft
	113		Ballast base

4.2 MECHANISM SECTION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DISC STABILIZER
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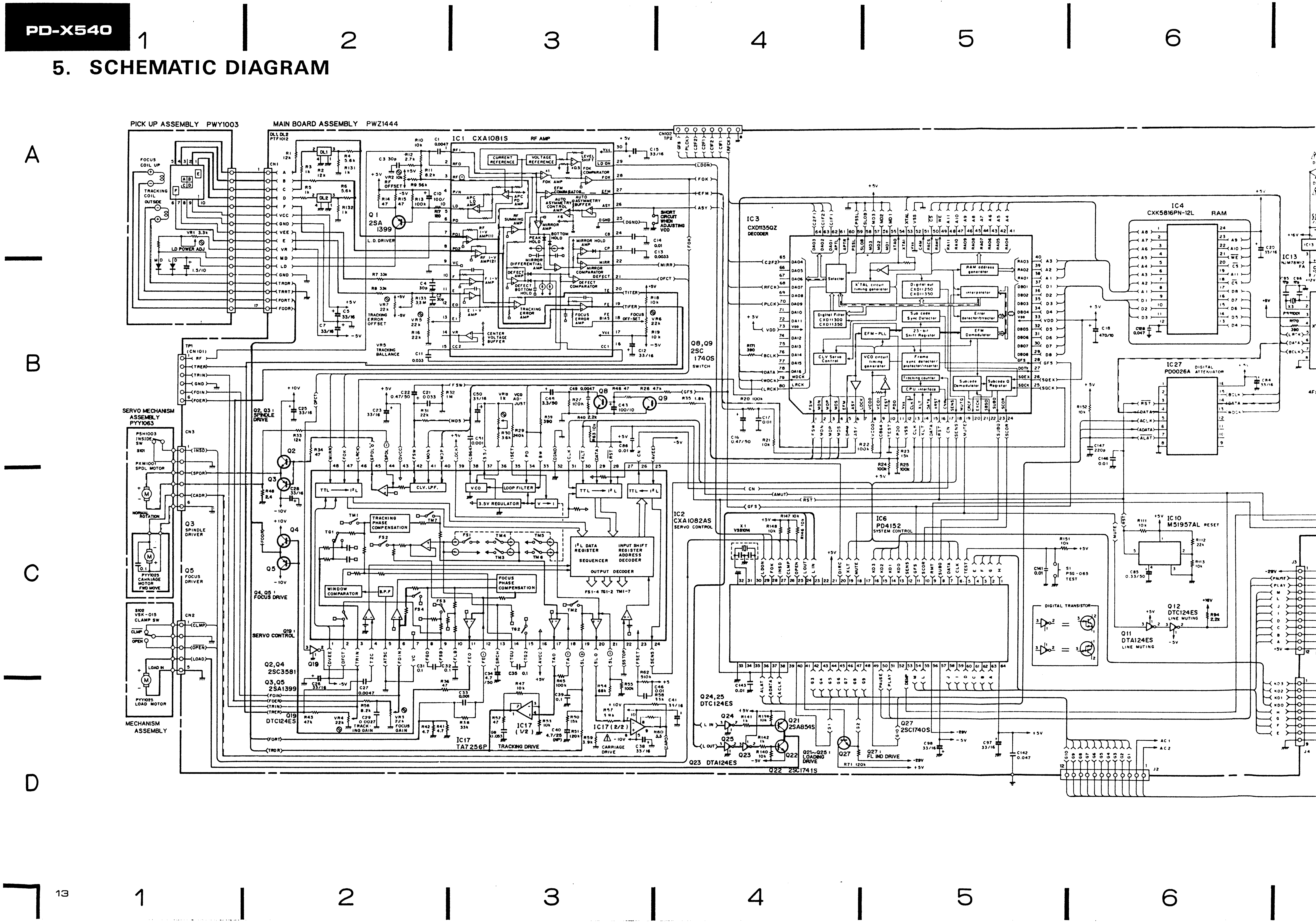
5. SCHEMATIC DIAGRAM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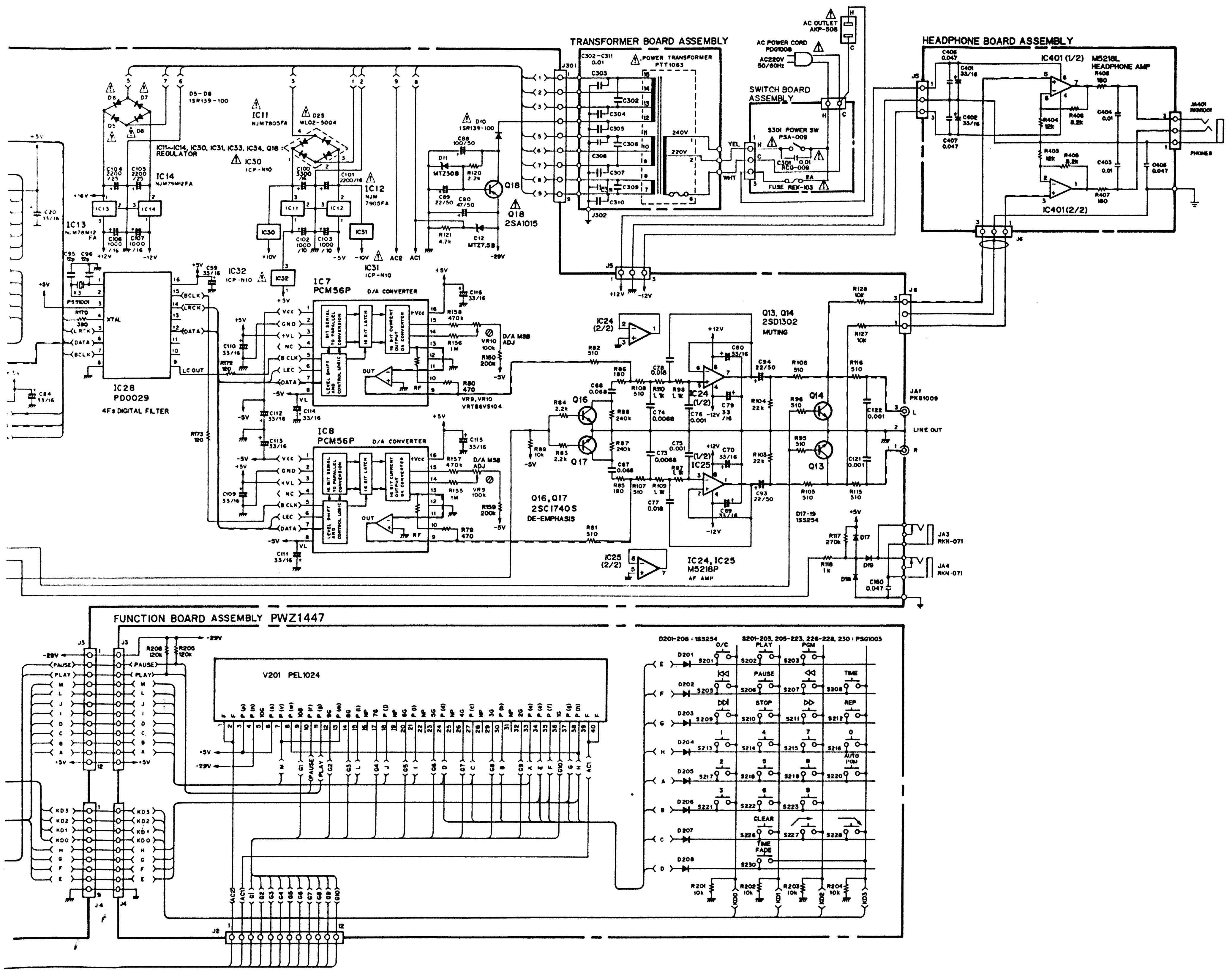
D
PICK UP ASSEMBLY PWY1003
MAIN BOARD ASSEMBLY PWZ1444
FOCUS COIL UP
TRACKING COIL OUTSIDE
LD POWER ADJ
VR1 3.3k
1.5/10
DL1 DL2 PTF1012
CN1
IC1 CXA1081S RF AMP
CURRENT REFERENCE
VOLTAGE REFERENCE
LEVEL SHIFT
FOK AMP
FOK COMPARATOR
EFM COMPARATOR
AUTO ASYMMETRY CONTROL AMP
AUTO ASYMMETRY BUFFER
APC LD AMP
APC PD AMP
RF SUMMING AMP
RF I-V AMP(1)
RF I-V AMP(2)
MIRROR AMP
PEAK HOLD
BOTTOM HOLD
MIRROR HOLD AMP
MIRROR DIFFERENTIAL AMP
MIRROR COMPARATOR
DEFECT AMP
DEFECT BOTTOM HOLD
DEFECT COMPARATOR
F I-V AMP
E I-V AMP
TRACKING ERROR AMP
FOCUS ERROR AMP
CENTER VOLTAGE BUFFER
SHORT CIRCUIT WHEN ADJUSTING VCO
FOCUS OFF-SET
TRACKING ERROR OFFSET
VR5 TRACKING BALLANCE
Q1 2SA1399 L.D. DRIVER
Q8,Q9 2SC1740S SWITCH
CN102 TP2
GFS PLCK C2F2 C2F1 C1F2 C1F1 RFCK
TP1 (CN101)
RF TRER TRIN GND FOIN FOER
SERVO MECHANISM ASSEMBLY PYY1063
PSH1003 INSIDE SW S101
PXM1001 SPDL MOTOR
NORMAL ROTATION
PYY1025 CARRIAGE MOTOR FWD MOVE
Q3 SPINDLE DRIVER
Q5 FOCUS DRIVER
S102 VSK-015 CLAMP SW
CLMP OPEN
LOAD IN
PYY1025 LOAD MOTOR
MECHANISM ASSEMBLY
CN3
CN2
Q2, Q3 SPINDLE DRIVE
Q4, Q5 FOCUS DRIVE
Q19 SERVO CONTROL
Q2,Q4 2SC3581
Q3,Q5 2SA1399
Q19 DTC124ES
IC2 CXA1082AS SERVO CONTROL
TTL → I²L
CLV LPF
VCO
LOOP FILTER
3.5V REGULATOR
TRACKING PHASE COMPENSATION
FOCUS PHASE COMPENSATION
WINDOW COMPARATOR
B.P.F
I²L DATA REGISTER
INPUT SHIFT REGISTER
ADDRESS DECODER
SEQUENCER
OUTPUT DECODER
FS1-4 TG1-2 TM1-7
VR4 TRACKING GAIN
VR3 FOCUS GAIN
VR8 VCO ADJUST
IC17 TA7256P TRACKING DRIVE
IC17 (1/2)
IC17 (2/2)
CARRIAGE DRIVE
IC3 CXD1135QZ DECODER
Selector
X'TAL circuit timing generator
Digital Filter CXD11300 CXD11350
Digital out CXD11250 CXD11350
Interpolator
RAM address generator
Error detector/corrector
EFM Demodulator
Sub code Sync Detector
23-bit Shift Register
EFM-PLL
CLV Servo Control
VCO circuit timing generator
Frame sync detector/protector/inserter
Tracking counter
CPU interface
Subcode Demodulator
Subcode Q Register
IC4 CXK5816PN-12L RAM
IC13 NJM78M12FA
IC27 PD0026A DIGITAL ATTENUATOR
IC6 PD4152 SYSTEM CONTROL
X1 VSB104
IC10 M51957AL RESET
S1 PSG-065 TEST
DIGITAL TRANSISTOR
Q12 DTC124ES LINE MUTING
Q11 DTA124ES LINE MUTING
Q24,25 DTC124ES
Q21 2SA854S
Q21~Q25 LOADING DRIVE
Q23 DTA124ES
Q22 2SC1741S
Q27 2SC1740S
Q27: FL IND DRIVE
J2
J3
J4
AC1 AC2


TRANSFORMER BOARD ASSEMBLY
POWER TRANSFORMER PTT1063
SWITCH BOARD ASSEMBLY
S301 POWER SW PSA-009
AC OUTLET AKP-508
AC POWER CORD PDG1008
AC220V 50/60Hz
FUSE REK-103
HEADPHONE BOARD ASSEMBLY
IC401 (1/2)
IC401 (2/2)
M5218L HEADPHONE AMP
JA401 RKN001
PHONES
D5-D8 1SR139-100
IC11 NJM7805FA
D25 WL02-5004
IC11~IC14, IC30, IC31, IC34, IC33, IC34, Q18 REGULATOR
IC30 ICP-N10
IC14 NJM79M12FA
IC12 NJM 7905FA
IC13 NJM78M12FA
IC31 ICP-N10
IC32 ICP-N10
D10 1SR139-100
Q18 2SA1015
D11 MTZ30B
D12 MTZ7.5B
IC28 PD0029
4Fs DIGITAL FILTER
XTAL
IC7 PCM56P D/A CONVERTER
IC8 PCM56P D/A CONVERTER
D/A MSB ADJ
VR9, VR10 VRT86VS104
IC24 (2/2)
IC25 (2/2)
Q13, Q14 2SD1302 MUTING
Q16, Q17 2SC1740S DE-EMPHASIS
IC24, IC25 M5218P AF AMP
D17-19 1SS254
JA1 PKB1009
LINE OUT
JA3 RKN-071
JA4 RKN-071
FUNCTION BOARD ASSEMBLY PWZ1447
V201 PEL1024
D201-208 : 1SS254
S201-203, 205-223, 226-228, 230 : PSG1003
O/C
PLAY
PGM
PAUSE
TIME
STOP
REP
CLEAR
TIME FADE
AUTO PGM
A
B
C
D

NOTE:

1. RESISTORS:
   Indicated in Ω, 1/8W & 1/4W, ±5% tolerance unless otherwise noted k; kΩ, M; MΩ, (F); ±1%, (G); ±2%, (K); ±10%, (M); ±20% tolerance

2. CAPACITORS:
   Indicated in capacity (μF)/voltage (V) unless otherwise noted p; pF. Indication without voltage is 50V except electrolytic capacitor.

3. VOLTAGE, CURRENT:
   ▭ ; DC voltage (V) at no input signal
   Value in ( ) is DC voltage at rated power.
   mA; DC current at no input signal

4. OTHERS:
   ➡ ; Signal route.
   ⊘ ; Adjusting point.

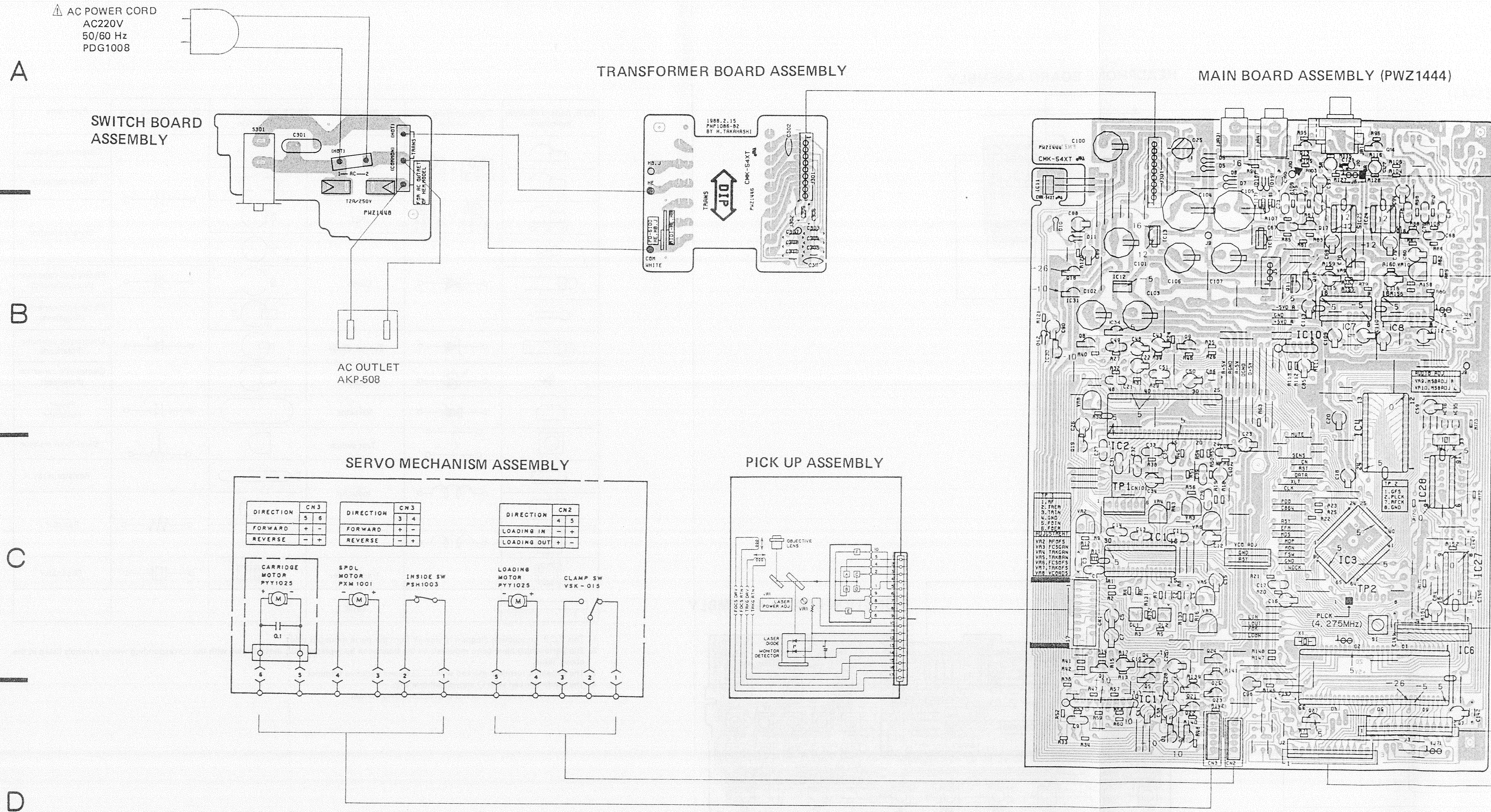
   The ⚠ mark found on some component parts indicates the importance of the safety factor of the part. Therefore, when replacing, be sure to use parts of identical designation.
   * marked capacitors and resistors have parts numbers.
   The underlined indicates the switch position.

   This is the basic schematic diagram, but the actual circuit may vary due to improvements in design.

5. SWITCHES : (The underlined indicates the switch position)
   MAIN BOARD ASSEMBLY
   S1 : TEST
   CONTROL BOARD ASSEMBLY
   S201 : OPEN/CLOSE
   S202 : PLAY
   S203 : PGM MEMORY
   S205 : ⏮ (TRACK SEARCH)
   S206 : PAUSE
   S207 : ⏪ (MANUAL SEARCH)
   S208 : TIME MODE
   S209 : ⏭ (TRACK SEARCH)
   S210 : STOP
   S211 : ⏩ (MANUAL SEARCH)
   S212 : REPEAT
   S213 : TRACK/MINUTE 1
   S214 : TRACK/MINUTE 4
   S215 : TRACK/MINUTE 7
   S216 : TRACK/MINUTE 0
   S217 : TRACK/MINUTE 2
   S218 : TRACK/MINUTE 5
   S219 : TRACK/MINUTE 8
   S220 : AUTO PGM
   S221 : TRACK/MINUTE 3
   S222 : TRACK/MINUTE 6
   S223 : TRACK/MINUTE 9
   S226 : CLEAR
   S227 : ⟋ (AUTO FADER)
   S228 : ⟍ (AUTO FADER)
   S230 : TIME FADE
   SWITCH BOARD ASSEMBLY
   S301 : POWER ON-OFF
   MECHANISM ASSEMBLY
   S101 : INSIDE
   S102 : CLAMP CLAMP-OPEN

——————— FOCUS SERVO LOOP
– – – – – – – – SIGNAL LINE
········· TRACKING SERVO LOOP
–·–·–·– CARRIAGE SERVO LOOP
——————— LOADING MOTOR
— — — — — SPINDLE SERVO LOOP

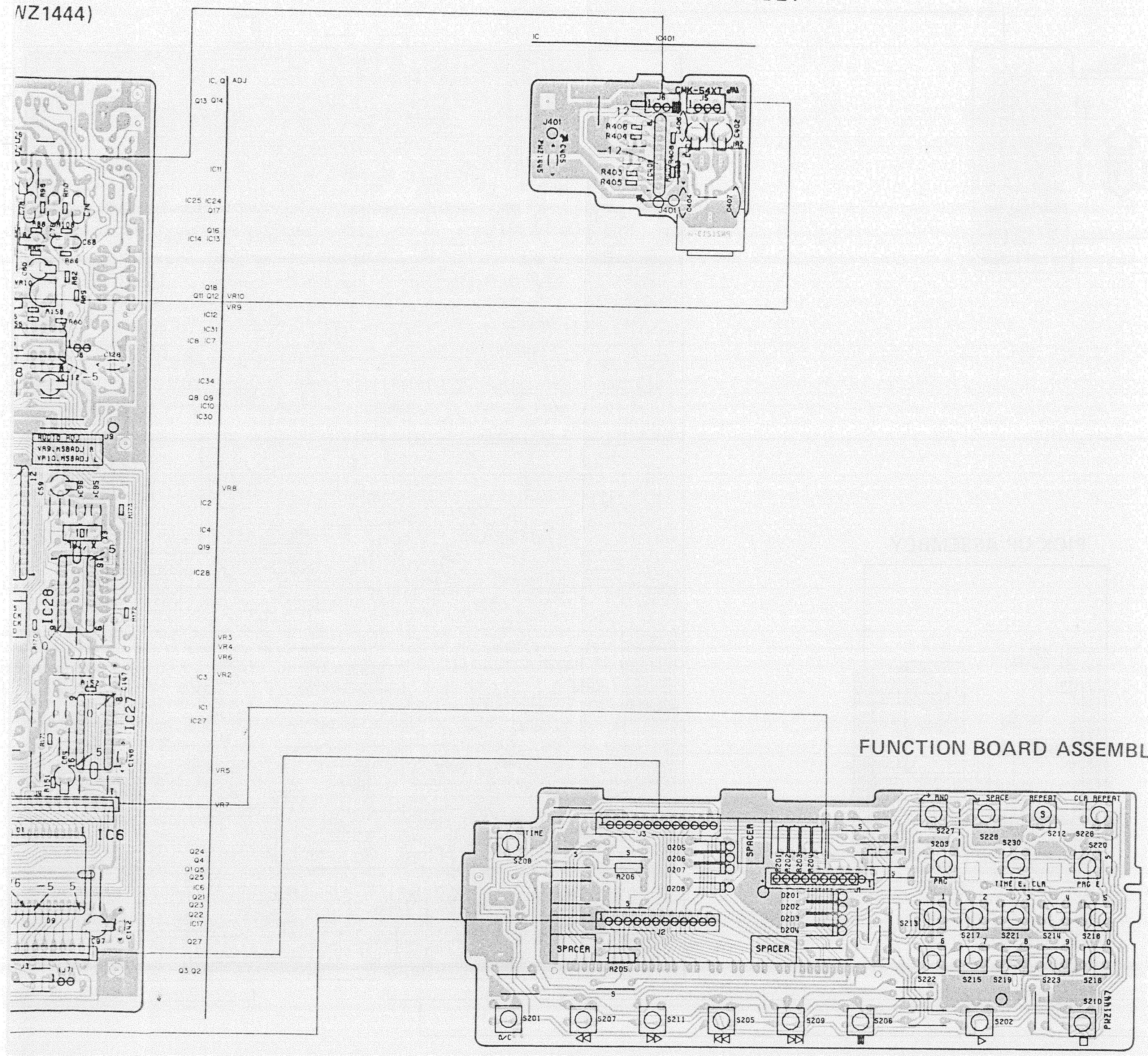
6. P.C. BOARDS CONNECTION DIAGRAM


⚠ AC POWER CORD
AC220V
50/60 Hz
PDG1008
SWITCH BOARD ASSEMBLY
S301
C301
(HOT)
(COMMON)
T2A/250V
PWZ1448
TRANS
FOR AC OUTLET OF HEM.MODEL
AC OUTLET
AKP-508
TRANSFORMER BOARD ASSEMBLY
1988.2.15
PNP1086-B2
BY H.TAKAHASHI
HB.J
HE
COM
WHITE
TRANS
DIP
CMK-54XT
PWZ1446
C102
J301
MAIN BOARD ASSEMBLY (PWZ1444)
PWZ1444
CMK-54XT
IC1
IC2
IC3
IC4
IC6
IC7
IC8
IC10
IC12
IC13
IC17
IC27
IC28
IC31
TP1
TP2
PLCK (4.275MHz)
CN2
CN3
MUTE
TP 1
1.RF
2.TRER
3.TRIN
4.GND
5.FOIN
6.FOER
ADJUSTMENT
VR2 RFOFS
VR3 FCSGAN
VR4 TRKGAN
VR5 TRKBAN
VR6 FCSOFS
VR7 TRKOFS
VR8 VCOADJ
TP 2
1.GFS
2.PLCK
3.RFCK
4.GND
AUDIO ADJ
VR9 MSBADJ R
VR10 MSBADJ L
SERVO MECHANISM ASSEMBLY
DIRECTION | CN3 5 6
FORWARD | + −
REVERSE | − +
DIRECTION | CN3 3 4
FORWARD | + −
REVERSE | − +
DIRECTION | CN2 4 5
LOADING IN | − +
LOADING OUT | + −
CARRIAGE MOTOR PYY1025
SPDL MOTOR PXM1001
INSIDE SW PSH1003
LOADING MOTOR PYY1025
CLAMP SW VSK-015
M
0.1
6
5
4
3
2
1
5
4
3
2
1
PICK UP ASSEMBLY
OBJECTIVE LENS
VR1
LASER POWER ADJ
LASER DIODE
MONITOR DETECTOR
A
B
C
D
1
2
3
4
5
6

WZ1444)

HEADPHONE BOARD ASSEMBLY

FUNCTION BOARD ASSEMBLY


IC
IC401
CMK-54XT
J401
R406
R404
R403
R405
C407
IC1
IC2
IC4
IC6
IC27
IC28
VR2
VR3
VR4
VR5
VR6
VR7
VR8
VR9
VR10
TIME
RND
SPACE
REPEAT
CLR REPEAT
PRG
TIME E
CLR
PRG E
SPACER
J2
J3
R205
R206
D201
D202
D203
D204
D205
D206
D207
D208
S201
S202
S205
S206
S207
S208
S209
S210
S211
S212
S213
S214
S215
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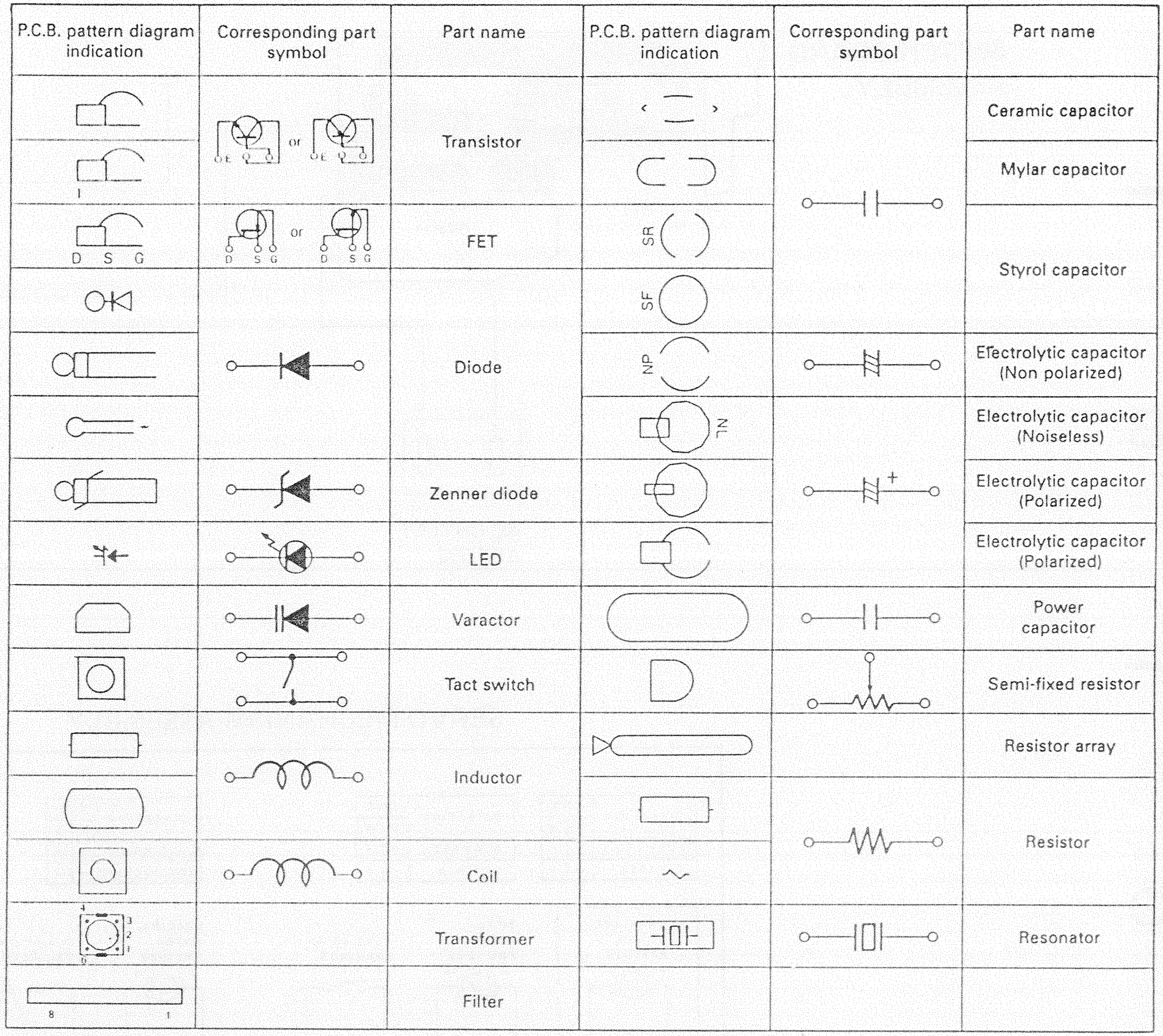
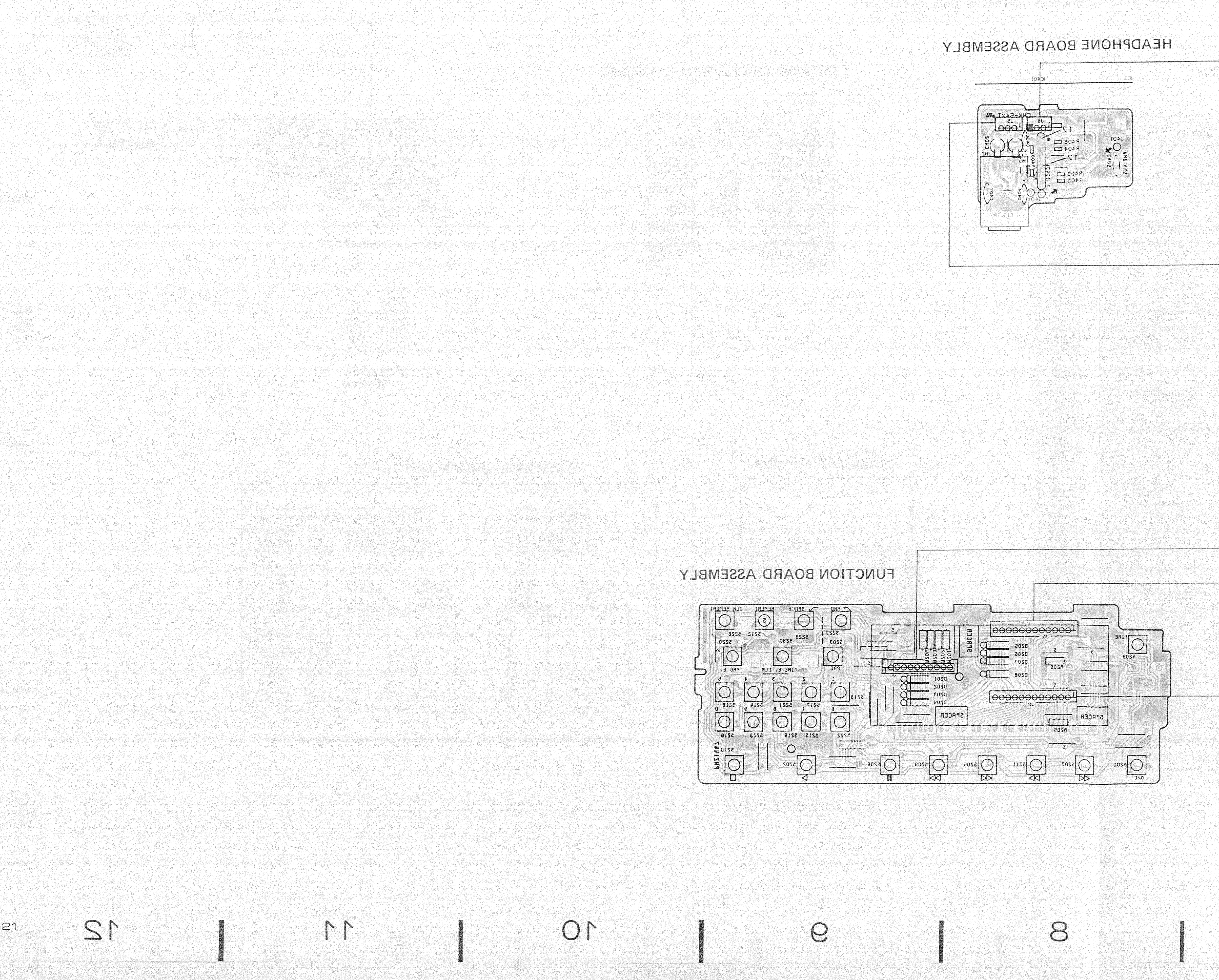
S217
S218
S219
S220
S221
S222
S223
S227
S228
S230
PWZ1447



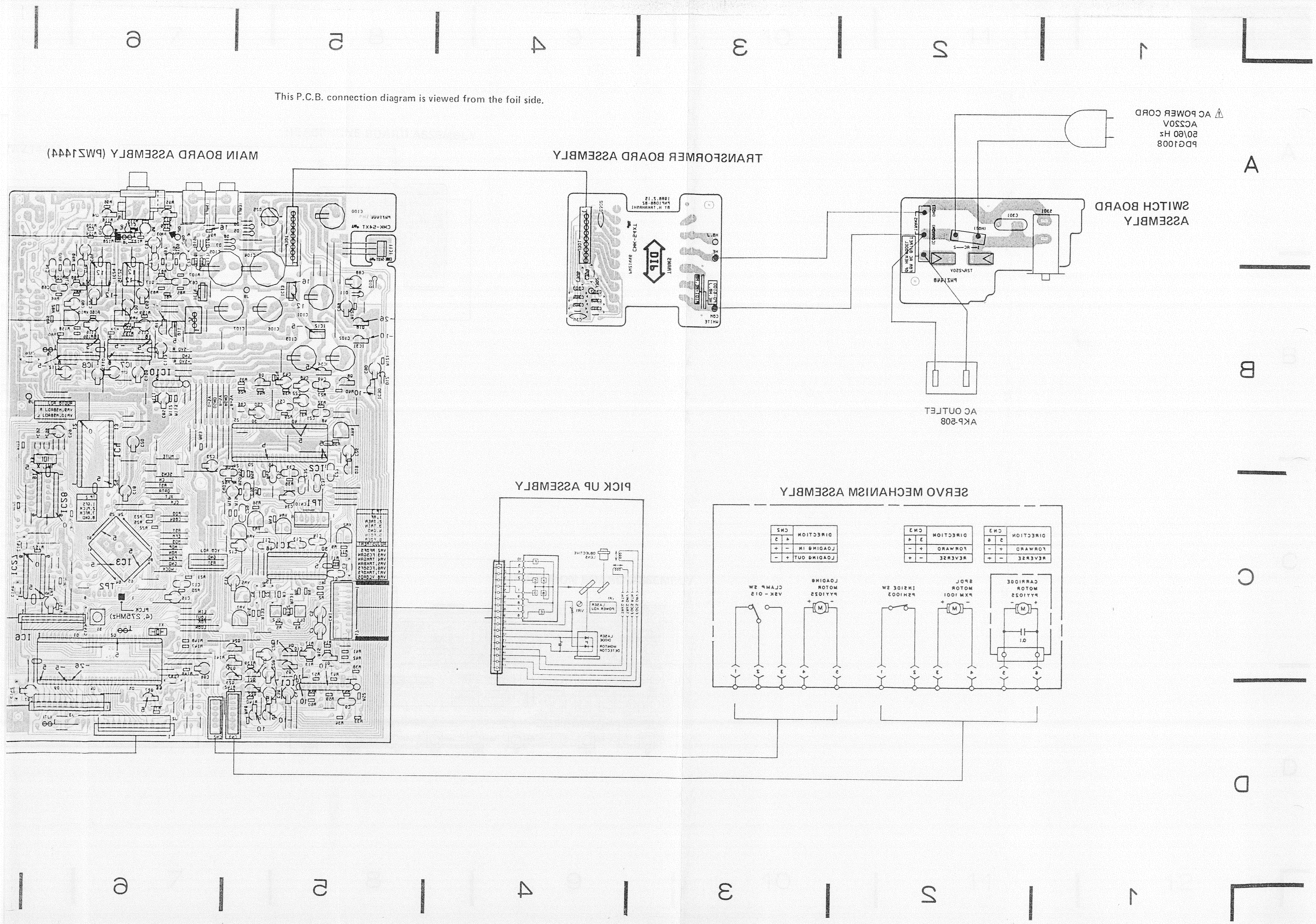
P.C.B. pattern diagram indication	Corresponding part symbol	Part name	P.C.B. pattern diagram indication	Corresponding part symbol	Part name
	or	Transistor			Ceramic capacitor
					Mylar capacitor
D S G	or D S G D S G	FET	SR		Styrol capacitor
			SF		
		Diode	NP		Electrolytic capacitor (Non polarized)
			NL		Electrolytic capacitor (Noiseless)
		Zenner diode			Electrolytic capacitor (Polarized)
		LED			Electrolytic capacitor (Polarized)
		Varactor			Power capacitor
		Tact switch			Semi-fixed resistor
		Inductor			Resistor array
					Resistor
		Coil			
		Transformer			Resonator
8 1		Filter			

1. This P.C.B. connection diagram is viewed from the parts mounted side.
2. The parts which have been mounted on the board can be replaced with those shown with the corresponding wiring symbols listed in the above Table.
3. The capacitor terminal marked with ▭ shows negative terminal.
4. The diode marked with ○ shows cathode side.
5. The transistor terminal marked with ▭ shows emitter.



A
B
C
D
1
2
3
4
5
6
SWITCH BOARD ASSEMBLY
TRANSFORMER BOARD ASSEMBLY
AC OUTLET
SERVO MECHANISM ASSEMBLY
PICK UP ASSEMBLY

This P.C.B. connection diagram is viewed from the foil side.

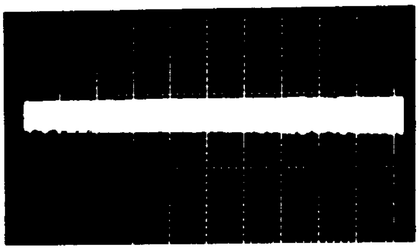


1
2
3
4
5
6
A
B
C
D
MAIN BOARD ASSEMBLY (PWZ1444)
TRANSFORMER BOARD ASSEMBLY
SWITCH BOARD ASSEMBLY
AC POWER CORD
AC220V
50/60 Hz
PDG1008
AC OUTLET
AKP-508
PICK UP ASSEMBLY
SERVO MECHANISM ASSEMBLY
CLAMP SW
LOADING MOTOR
INSIDE SW
SPDL MOTOR
CARRIAGE MOTOR
DIRECTION
LOADING IN
LOADING OUT
FORWARD
REVERSE
OBJECTIVE LENS
LASER DIODE
LASER POWER ADJ.
VR1
IC1
IC2
IC3
IC6
IC7
IC8
IC10
CN1
CN2
CN3
TP1
TP2

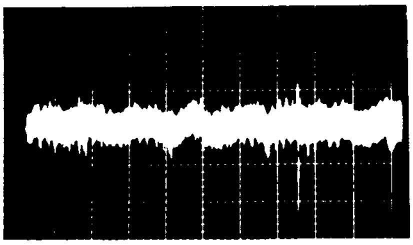
WAVE FORMS

NOTE: The encircled numbers denote measuring points in the circuit and pattern diagrams.

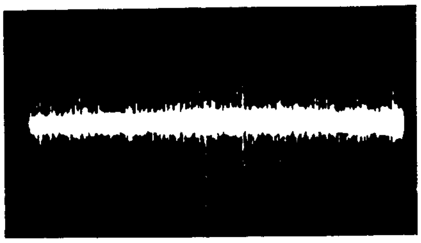
① CN1-5 Pin: PLAY MODE
100mV/Div 5m sec/Div



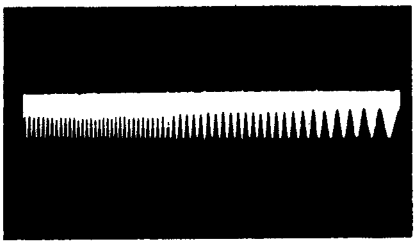
③ TP1-6 Pin: SEARCH MODE
500mV/Div 10mS/Div



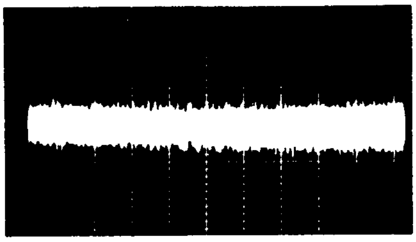
⑥ IC17-2Pin: PLAY MODE
2V/Div 10mS/Div



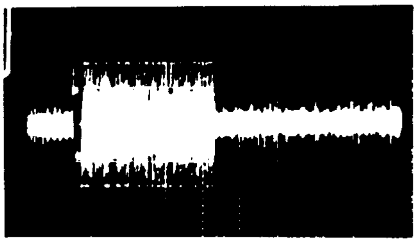
① CN1-5 Pin: SEARCH MODE
100mV/Div 5m sec/Div



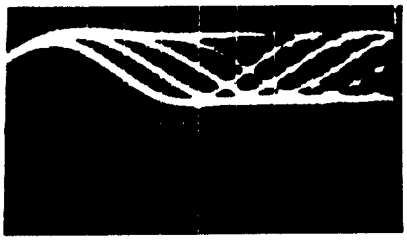
④ TP1-2 Pin: PLAY MODE
1V/Div 10mS/Div



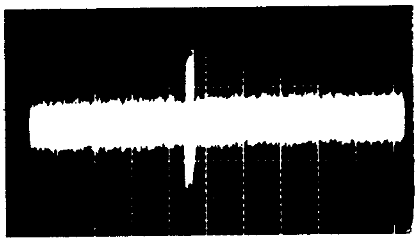
⑥ IC17-2Pin: SEARCH MODE
2V/Div 10mS/Div



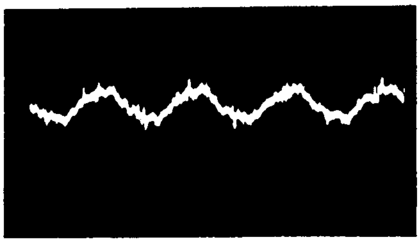
② TP1-1 Pin: PLAY MODE
1V/Div 200n sec/Div



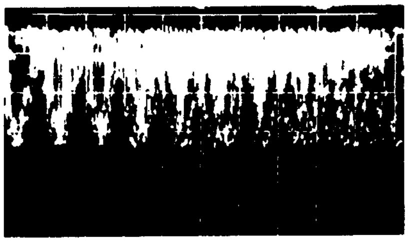
④ TP1-2 Pin: SEARCH MODE
1V/Div 10mS/Div



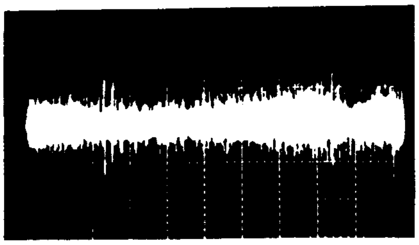
⑦ Q2E: PLAY MODE
2V/Div 50mS/Div



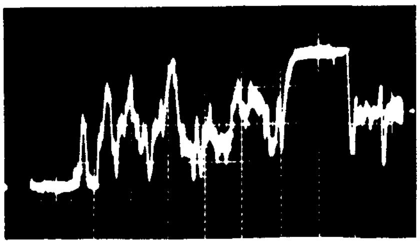
② TP1-1 Pin: SEARCH MODE
500mV/Div 5m sec/Div



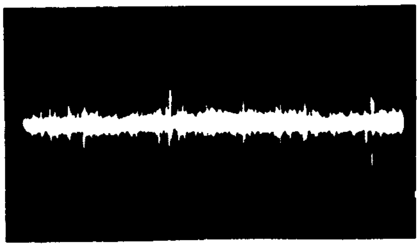
⑤ Q4 Emitter: PLAY MODE
2V/Div 10mS/Div



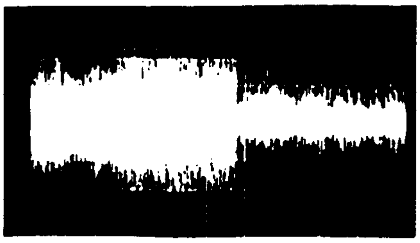
⑦ Q2E: SEARCH MODE
2V/Div 100mS/Div



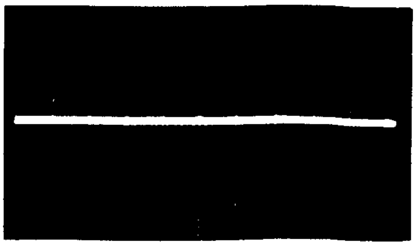
③ TP1-6 Pin: PLAY MODE
500mV/Div 10m sec/Div



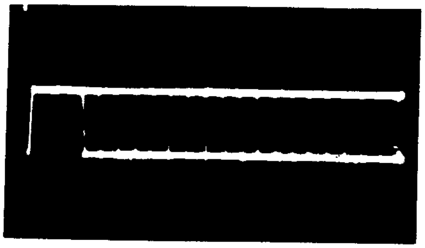
⑤ Q4 Emitter: SEARCH MODE
2V/Div 10mS/Div



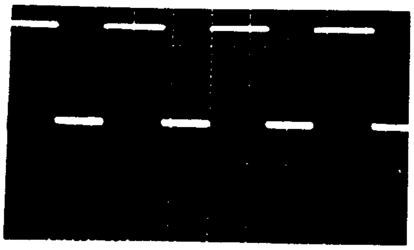
⑧ IC2, 34 Pin: PLAY MODE
2V/Div 10mS/Div



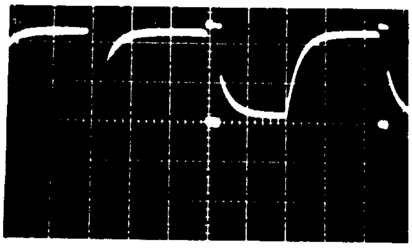
⑨ IC1 27 Pin: PLAY MODE
2V/Div 500n sec/Div



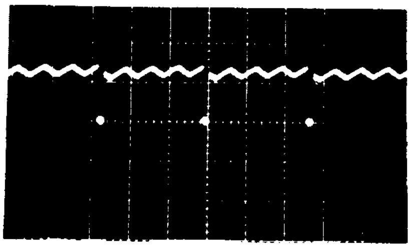
⑩ IC3-4: PLAY MODE
2V/Div 50μS/Div



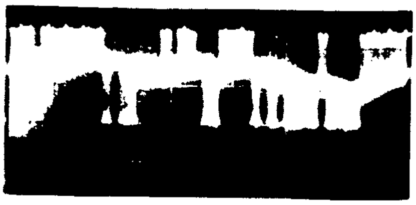
⑩ IC3-4: SEARCH MODE
2V/Div 100mS/Div



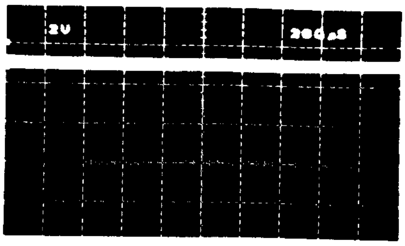
⑪ IC3-3: PLAY MODE
2V/Div 200μS/Div



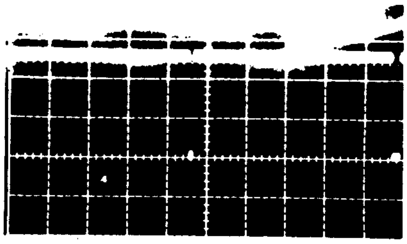
⑪ IC3-3: SEARCH MODE
2V/Div 10mS/Div



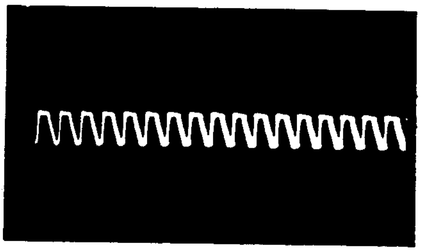
⑫ TP2-1: PLAY MODE
2V/Div 200μS/Div



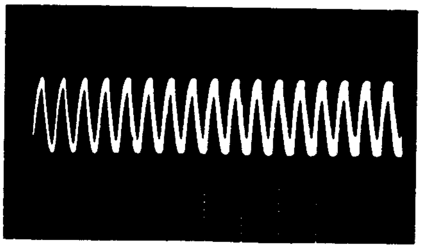
⑫ TP2-1: SEARCH MODE
2V/Div 20mS/Div



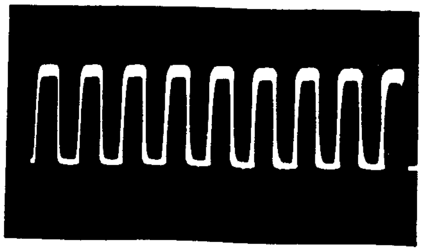
⑬ IC2-38: PLAY MODE
2V/Div 200μS/Div



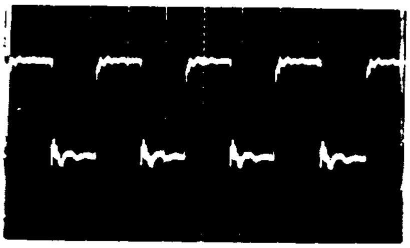
⑭ IC3-8: PLAY MODE
2V/Div 200μS/Div



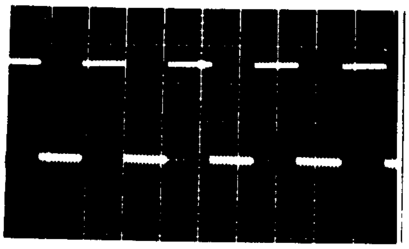
⑮ TP2-2: PLAY MODE
2V/Div 200μS/Div



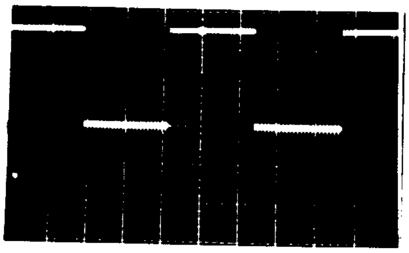
⑯ IC3-76: STOP MODE
2V/Div 200nS/Div



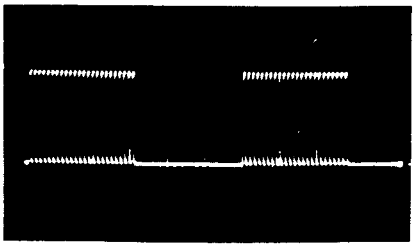
⑰ IC3-79: STOP MODE
2V/Div 5μS/Div



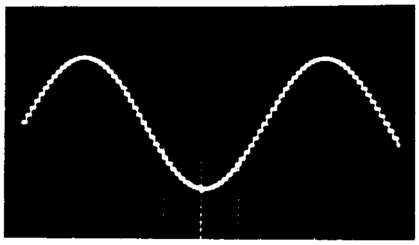
⑱ IC3-80: STOP MODE
2V/Div 5μS/Div



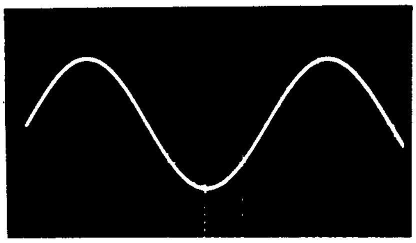
⑲ IC28-9: STOP MODE
2V/Div 1μS/Div



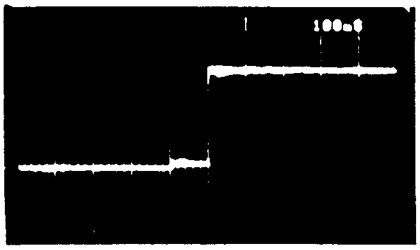
⑳ IC7-9: PLAY MODE
2V/Div 50μS/Div



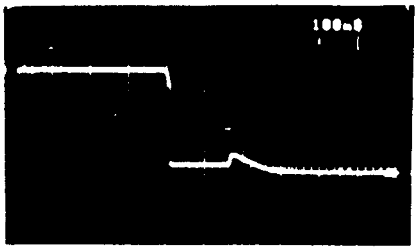
㉑ OUTPUT Lch: PLAY MODE
2V/Div 50μS/Div



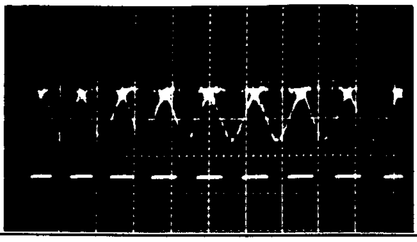
㉒ IC10-5: POWER ON
2V/Div 100mS/Div



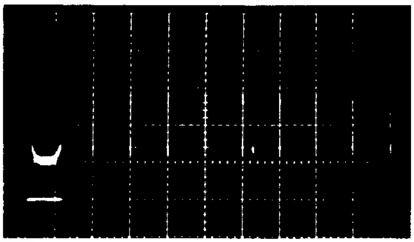
㉒ IC10-5: POWER-OFF
2V/Div 100mS/Div



㉓ IC1-22: TR OPEN
1mS/Div
Upper TP1-1, 1V/Div
Lower IC1-22, 2V/Div

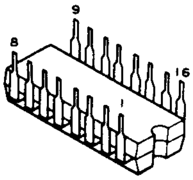


㉔ IC1-21: DFCT
1mS/Div
Upper TP1-1, 1V/Div
Lower IC1-21, 5V/Div

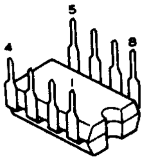


External Appearance of Transistors and ICs

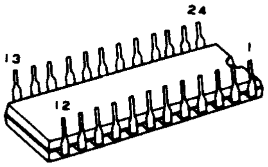
PD0029
PD0026A
PCM56P



M5218P



LH5116-15
CXK5816PN-12L
CXK5816PN-15L



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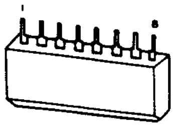
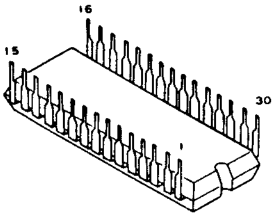
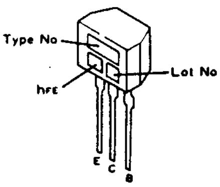


CXA1081S



2SC1741S
2SC1740S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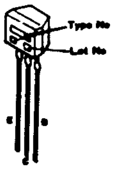
hFE
Lot No
E
C
B

DTC124ES
DTA124ES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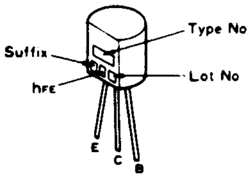
2SD1302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Suffix
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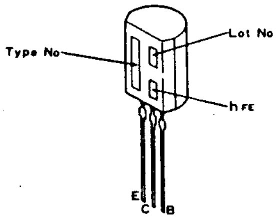
C
B

2SC3581
2SA1399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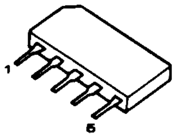
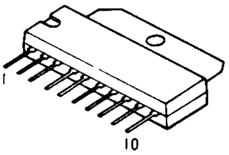
Type No
hFE
E
C
B

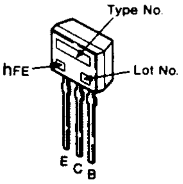
M51957AL



TA7256P



2SA854S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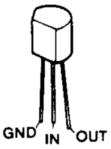
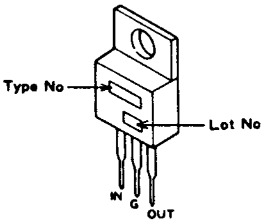
hFE
Lot No.
E
C
B

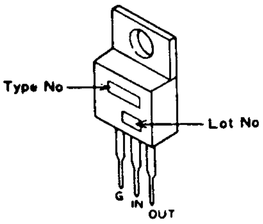
NJM79L12A



NJM7805FA


Type No
Lot No
IN
G
OUT

NJM7905FA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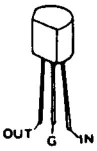
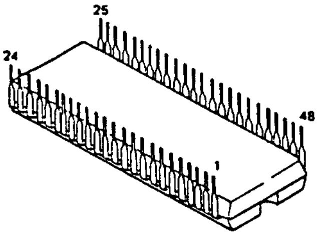
Lot No
G
IN
OUT

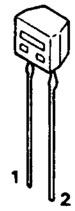
NJM78L12A



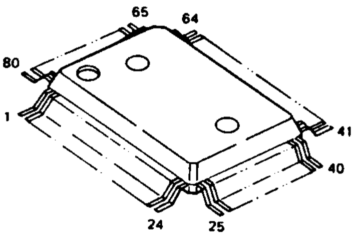
CXA1082AS



ICP-N10



CXD1135QZ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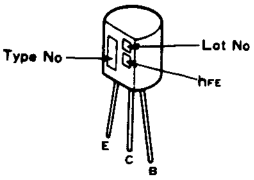
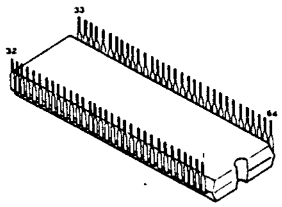
80
1
41
40
24
25

2SA1015


Lot No
Type No
hFE
E
C
B

PD4152



7. ELECTRICAL PARTS LIST

NOTES:

- *Parts without part number cannot be supplied.*
- *Parts marked by "⊙" are not always kept in stock. Their delivery time may be longer than usual or they may be unavailable.*
- *The ⚠ mark found on some component parts indicates the importance of the safety factor of the part. Therefore, when replacing, be sure to use parts of identical designation.*
- *For your parts Stock Control, the fast moving items are indicated with the marks ★★ and ★.*
  ★★ GENERALLY MOVES FASTER THAN ★
  This classification shall be adjusted by each distributor because it depends on model number, temperature, humidity, etc.
- *When ordering resistors, first convert resistance values into code form as shown in the following examples.*
  Ex. 1 When there are 2 effective digits (any digit apart from 0), such as 560 ohm and 47k ohm (tolerance is shown by J = 5%, and K = 10%).
  560Ω 56 × 10^1 561 .... RD1/4PS $\boxed{5}\boxed{6}\boxed{1}$ J
  47kΩ 47 × 10^3 473 .... RD1/4PS $\boxed{4}\boxed{7}\boxed{3}$ J
  0.5Ω 0R5 .... RN2H $\boxed{0}\boxed{R}\boxed{5}$ K
  1Ω 010 .... RS1P $\boxed{0}\boxed{1}\boxed{0}$ K

  Ex. 2 When there are 3 effective digits (such as in high precision metal film resistors).
  5.62kΩ 562 × 10^1 5621 .... RN1/4SR $\boxed{5}\boxed{6}\boxed{2}\boxed{1}$ F

MISCELLANEOUS PARTS

P.C. BOARD ASSEMBLIES

Mark		Symbols & Description	Part No.
⚠	⊙	Main board assembly	PWZ1444
		Headphone board assembly	
		Transformer board assembly	
	⊙	Function board assembly	PWZ1447
⚠		Switch board assembly	

OTHERS

Mark		Symbol & Description	Part No.
⚠		1P AC outlet	AKP-508
⚠		Strain relief	CM-22B
⚠		AC power cord	PDG1008
⚠	★	Power transformer (AC 220/240V)	PTT1063
⚠	★★	Fuse (T2A)	REK-103
	★★	Spindle motor	PXM1001
	★★	Motor assembly (CARRIAGE, LOADING)	PYY1025
	★★	S101 Slide switch (INSIDE)	PSH1003
	★★	S102 Leaf switch (OPEN/CLAMP)	VSK-015
		Pick-up assembly	PWY1003
		Mechanism assembly	PYY1063
		Semiconductive ceramic capacitor	CGDYX104M25

⚠⊙MAIN BOARD ASSEMBLY (PWZ1444)

SEMICONDUCTORS

Mark		Symbol & Description	Part No.
	★★	IC1	CXA1081S
	★★	IC2	CXA1082AS
	★★	IC3	CXD1135QZ
	★★	IC4	CXK5816PN-12L (CXK5816PN-15L) (LH5116-15)
⚠	★★	IC30–IC32	ICP-N10
	★★	IC10	M51957AL
	★★	IC24, IC25	M5218P
	★★	IC13	NJM78M12FA
⚠	★★	IC11	NJM7805FA
	★★	IC14	NJM79M12FA
⚠	★★	IC12	NJM7905FA
	★★	IC7, IC8	PCM56P
	★★	IC27	PD0026A
	★★	IC28	PD0029
	★★	IC6	PD4152
⚠	★★	IC17	TA7256P
	★★	Q11, Q23	DTA124ES
	★★	Q12, Q19, Q24, Q25	DTC124ES
⚠	★★	Q18	2SA1015
	★★	Q1, Q3, Q5	2SA1399
	★★	Q21	2SA854S
	★★	Q8, Q9, Q16, Q17, Q27	2SC1740S
	★★	Q22	2SC1741S
	★★	Q2, Q4	2SC3581
	★★	Q13, Q14	2SD1302
	★	D11	MTZ30B (MTZ30C)
	★	D12	MTZ7.5B (MTZ7.5C)
⚠	★	D25	WL02-5004-L
⚠	★	D5–D8, D10	1SR139-100
	★	D17–D19	1SS254

SWITCH

Mark	Symbol & Description	Part No.
★★	S1 Tact switch (TEST)	PSG-065

CAPACITORS

Mark	Symbol & Description	Part No.
	C2–C4	CCCCH300J50
	C147	CCCSL221J50
	C40	CEANP4R7M25
	C85	CEASR33M50
	C16, C22	CEASR47M50
	C34	CEAS4R7M50
	C10, C43	CEAS101M10
	C88	CEAS101M50
	C102, C103	CEAS102M10
	C106, C107	CEAS102M16
	C89, C93, C94	CEAS220M50
	C101	CEAS222M16
	C104, C105	CEAS222M25
	C48	CEAS3R3M50
	C5, C7, C12, C15, C20, C23, C25, C26, C28, C38, C41, C50, C59, C69, C70, C79, C80, C84, C97, C98, C109–C116	CEAS330M16
	C90	CEAS470M50
⚠	C86	CKCYF103Z50
	C141, C143, C146	CKCYF103Z50
⚠	C160	CKCYF473Z50
	C33, C51, C75, C76	CQMA102J50
	C14, C17, C46	CQMA103K50
	C31, C32, C35, C39	CQMA104K50
	C29	CQMA272J50
	C13	CQMA332J50
	C9, C11, C21	CQMA333K50
	C1, C27, C49	CQMA472J50
	C67, C68	CQMA683J50
	C121, C122	CQSA102J50
	C95, C96	CCCCH120J50
	C100	CEAS332M16
	C128, C142	CKCYF473Z50
	C18	CEAS471M10
	C77, C78	CQMA183J50
	C73, C74	CQMA682J50

RESISTORS

Mark	Symbol & Description	Part No.
★	VR2 Semi-fixed resistor	VRTB6VS103
★	VR3–VR7 Semi-fixed resistor	VRTB6VS223
★	VR8 Semi-fixed resistor	VRTS6VS102
★	VR9, VR10 Semi-fixed resistor	VRTB6VS104
	R30 Metal film resistor	RN1/6PQ3601F
	Other resistor	RD1/6PM□□□J

OTHERS

Mark	Symbol & Description	Part No.
	JA1 2P terminal	PKB1009
	JA3, JA4 3.5φ mini jack	RKN-071
★	X3 Crystal resonator (16.9344 MHz)	PSS1001
★	X1 Ceramic resonator (4.19 MHz)	VSS1014
	DL1, DL2 Delay line (200n sec)	PTF1012

HEADPHONE BOARD ASSEMBLY

SEMICONDUCTOR

Mark	Symbol & Description	Part No.
★★	IC401	M5218L

CAPACITORS

Mark	Symbol & Description	Part No.
	C401, C402	CEAS330M16
	C403–C405	CKCYF103Z50
	C406	CKCYF473Z50
	C407	CKDYF473Z50

RESISTORS

Mark	Symbol & Description	Part No.
	R403–R408	RD1/6PM□□□J

OTHERS

Mark	Symbol & Description	Part No.
	JA2 Phone jack (PHONES)	PKN1001

⊙FUNCTION BOARD ASSEMBLY (PWZ1447)

SEMICONDUCTOR

Mark	Symbol & Description	Part No.
★	D201–D208	1SS254

SWITCHES

Mark	Symbol & Description	Part No.
★★	S201–S203, S205–S223, S226–S228, S230 Tact switch (OPEN/CLOSE, PLAY, PGM MEMORY, TRACK SEARCH, PAUSE, MANUAL SEARCH, TIME MODE, STOP, REPEAT, TRACK/MINUTE 0–9, AUTO PGM, CLEAR, AUT FADER, TIME FADE)	PSG1003

RESISTORS

Mark	Symbol & Description	Part No.
	R201–R206	RD1/4PM□□□J

OTHERS

Mark	Symbol & Description	Part No.
★	V201 Fluorescent indicator tube	PEL1024

⚠TRANSFORMER BOARD ASSEMBLY

CAPACITORS

Mark	Symbol & Description	Part No.
	C302–C311	CKCYF103Z50

SWITCH BOARD ASSEMBLY

SWITCH

Mark	Symbol & Description	Part No.
⚠ ★★	S301 Power switch	PSA-009

CAPACITOR

Mark	Symbol & Description	Part No.
⚠	C301 (0.01 μF/AC400V)	RCG-009

8. ADJUSTMENTS

The adjustments for this unit are shown below. Adjustments must be made in the order in which they are listed.

• ADJUSTMENTS

1. Tracking error offset, focus offset and RF offset adjustment
2. RF level adjustment
3. LD (laser diode) power check
4. Focus lock and spindle lock check
5. Grating adjustment (1), (2)
6. Tracking balance adjustment
7. Tangential adjustment
8. Focus gain adjustment
9. Tracking gain adjustment
10. VCO free run frequency adjustment
11. Focus error check
12. MSB adjustment

• REQUIRED EQUIPMENT

1. Dual trace oscilloscope
2. Optical power meter
3. Test disc (YEDS-7)
4. Loop gain adjustment filter
5. Signal generator
6. Frequency counter
7. Other commonly used measuring equipment

• ABOUT THE TEST MODE

All adjustments must be carried out with the unit in the test mode.

Activating and releasing the test mode

(1) To activate the test mode, turn ON the power switch (S301) with the test mode switch (S1) in the ON position.

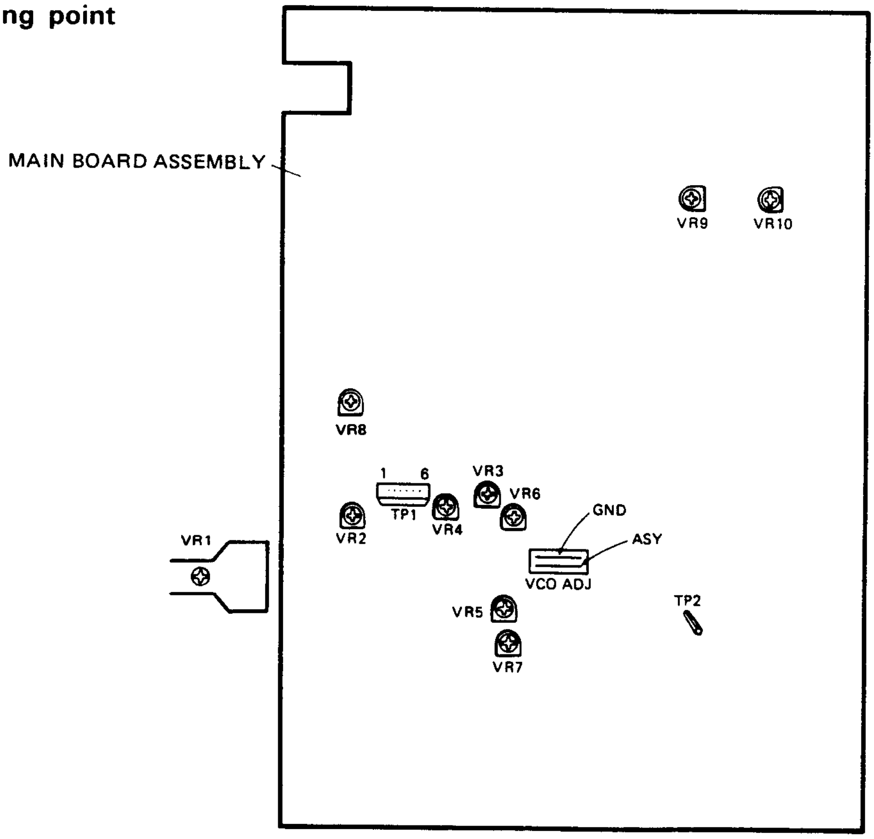
(2) The test mode is released by turning the power switch OFF.

The functions for the keys in the test mode are outlined in Table 8-1.

• ADJUSTMENT VRs AND THEIR NAMES

VR1: Laser power
VR2: RF offset (RF.OFS)
VR3: Focus gain (FCS.GAN)
VR4: Tracking gain (TRK.GAN)
VR5: Tracking balance (TRK.BAL)
VR6: Focus offset (FCS.OFS)
VR7: Tracking offset (TRK.OFS)
VR8: VCO adjust (VCO.ADJ)
VR9: MSB adjust R-CH (MSB.ADJ-R)
VR10: MSB adjust L-CH (MSB.ADJ-L)

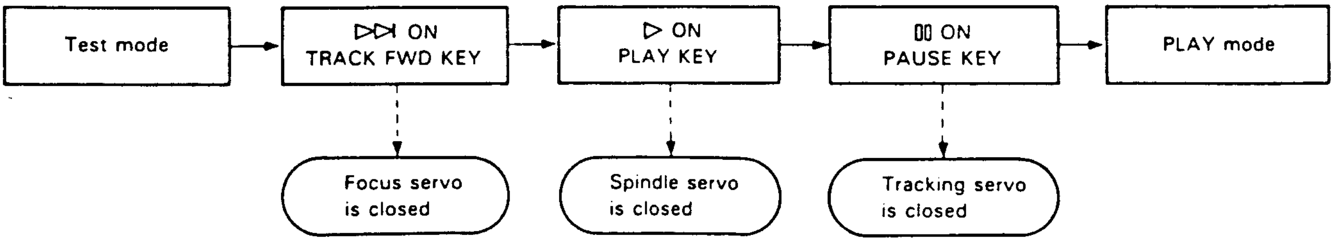
Adjusting point



In the test mode, the servos must be closed and opened individually. Consequently, the servos must each be closed in the proper sequence (serial sequence) in order to put the machine into the play mode. Note also that during test mode the unit will not enter the play mode when the PAUSE (⏸) key is pressed alone.

For example, in order to change from the stop to the play mode, the function keys must be pressed in the following order:

* In the test mode, the servos must be operated in serial sequence.

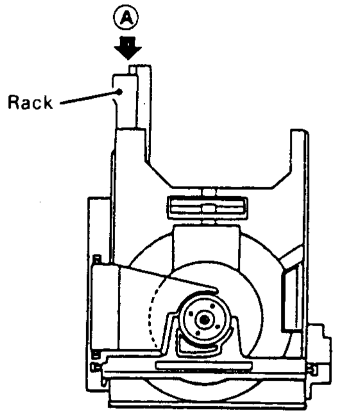
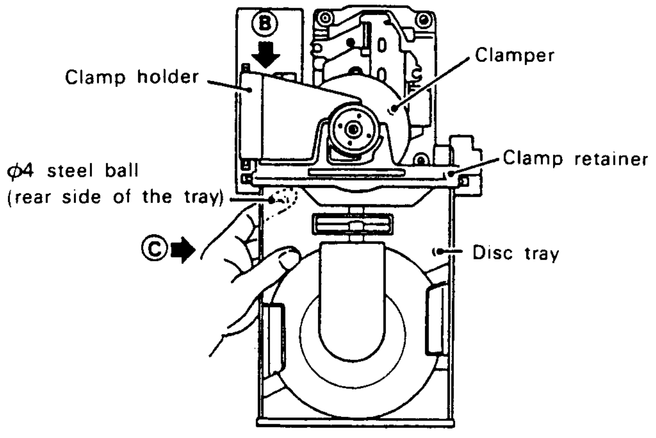


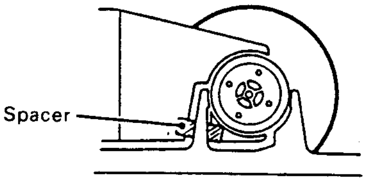
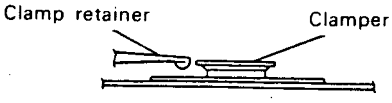
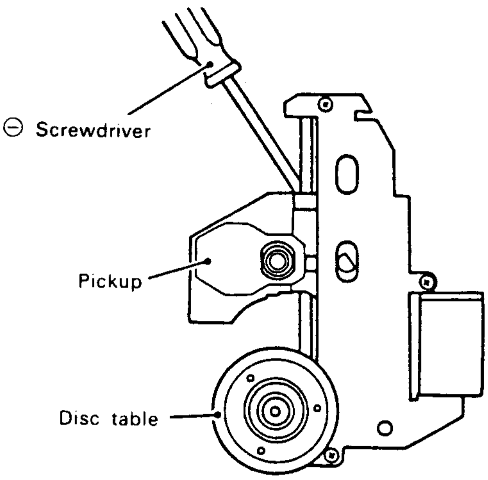
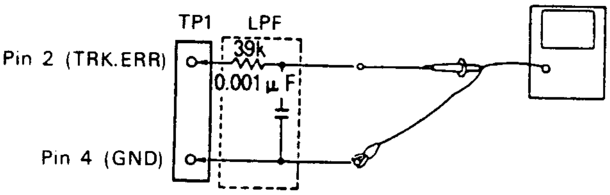
• KEY FUNCTIONS IN THE TEST MODE

Symbol	Key name	Function in test mode	Description
⏭	TRACK FWD	Focus servo close	Turns ON the laser diode, and raises and lowers the focusing actuator to close the focus servo.
▷	PLAY	Spindle servo close	Closes the servo in the CLV-A mode after kicking the spindle motor.
⏸	PAUSE	Tracking servo close/open	Acts as toggle: closes the tracking servo and activates play mode when pressed (provided the focus and spindle servos are closed), at which time the PAUSE indicator illuminates; opens the tracking servo when pressed again.
◁◁	MANUAL SEARCH REV	Carriage reverse (moves inward)	Moves carriage quickly (3 cm/s) toward inner-most track. Be careful not to move too far as there is no safety device to stop the carriage.
▷▷	MANUAL SEARCH FWD	Carriage forward (moves outward)	Moves carriage quickly (3 cm/s) toward outer-most track. Be careful not to move too far as there is no safety device to stop the carriage.
□	STOP	Stop	Stops all servos and returns system to its initial state.
⏏	OPEN/CLOSE	Disc tray open/close	Opens and closes the disc tray. However, pickup does not return to rest on OPEN, and it remains stationary on CLOSE.

Table 8-1

Step No.	Oscilloscope Setting		Test Points	Adjusting Points	Check items/ Adjustement specifications	Adjustment procedure
	V	H				
1	**Tracking error offset, focus offset and RF offset adjustment**					
			TP1 Pin 2 (TRK.ERR) TP1 Pin 6 (FCS.ERR) TP1 Pin 1 (RF. OUTPUT)	VR5 (TRK.BAL) VR7 (TRK.OFS) VR6 (FCS.OFS) VR2 (RF.OFS)	Tracking error offset 45 0V±50 mV Focus offset 0V±50 mV RF offset 100 mV±50 mV	● Set the unit to test mode (see page 32). ● Set VR5 TRK.BAL (tracking balance) to the position about 45 to the left of center. ● Adjust VR7 TRK.OFS (tracking offset) so that the TRK.ERR (tracking error) voltage at TP1 Pin 2 becomes 0V±50 mV. ● Adjust VR6 FCS.OFS (focus offset) so that the FCS.ERR (focus error) voltage at TP1 Pin 6 becomes 0V±50 mV. ● Adjust VR2 RF.OFS (RF offset) so that the RF output voltage at TP1 Pin 1 becomes 100 mV±50 mV. Note: When adjusting the tracking error offset, always perform "6. Tracking Balance Adjustment."
2	**RF level adjustment**					
			TP1 Pin 1 (RF OUTPUT)	VR1 (Laser power)	1.8V±0.1V	● Set the unit to test mode (see page 32). ● Play the test disc, connect the oscilloscope to TP1 Pin 1 (RF output), and measure the P-P voltage of the RF waveform. ● Check that the voltage is 1.8V±0.1V
3	**LD (laser diode) power check**					
					Less than 0.13 mW	● Set the unit to test mode (see page 32). ● Press the TRACK FWD (⊳⊳|) key to turn ON the LD (laser diode). ● Place the sensor of the optical power meter directly above the objective lens and confirm that LD power is less than 0.13 mW.

Step No.	Oscilloscope Setting		Test Points	Adjusting Points	Check items/ Adjustement specifications	Adjustment procedure
	V	H				
4	**Focus lock and spindle lock check**					
	V 0.5V/div	H 100 msec/div	TP1 Pin 1 (RF output)		RF signal is output Forward (clockwise) rotation	• Set the test disc. • Set the unit to test mode **(see page 32)**. • Press the MANUAL SEARCH FWD (▷▷) key to move the pickup to the center of the disc. • Observe the output (RF output) of TP1 Pin 1 on the oscilloscope. Confirm that the RF signal is output after the TRACK FWD (▷▷|) key is pressed. • Press the PLAY (▷) key and confirm that the disc rotates at constant speed (approx. 300 rpm near center of disc) in the forward (clockwise) direction; make sure that the disc does not rotate too fast or counterclockwise.
5	**Grating adjustment (1)**					
	 Fig. 8-1  Ⓑ Clamp holder Clamper ϕ4 steel ball (rear side of the tray) Clamp retainer Ⓒ Disc tray Fig. 8-2					Remove the disc tray before beginning this adjustment. • **Removal of the disc tray** 1. Press the rear edge of the rack, marked Ⓐ in **Fig.8-1., while pulling the disc tray out to the position where it catches, illustrated in Fig. 8-2.** (*1) When the rear section of the rack (arrow Ⓐ) is pressed, first the disc clamp is released. To slide out the disc tray fully, continue to press after the clamp has been released. 2. While pulling the clamp holder Ⓑ **(see** Fig. 8-2.) upward with the right hand, hold the tray as indicated by Ⓒ in the left hand and pull it outward. Take care not to allow the ϕ4 steel ball to fall out (it is recommended to hold the ball in place with the left index finger while extracting the tray).

Step No.	Oscilloscope Setting		Test Points	Adjusting Points	Check items/ Adjustement specifications	Adjustment procedure
	V	H				
	 Fig. 8-3					
	 Fig. 8-4					
	 Fig. 8-5  TP1 LPF Pin 2 (TRK.ERR) 39k 0.001 µF Pin 4 (GND) Fig. 8-6					• Set the unit to test mode (see page 32). • Press the MANUAL SEARCH FWD (▷▷) key to move the pickup to the vicinity of what would be the center of the disc. Position the pickup so its grating adjustment screw is visible through the elongated hole on the spindle motor side of the servo mechanism base plate. • As shown in Fig. 8-5., insert a ⊖ screwdriver (2 mm precisional screwdriver) from the rear of the mechanism and check that the grating adjustment screw can be rotated. • Mount the test disc; be sure to insert a 3 − 5 mm spacer (if no spacer is available, use a hex wrench) between the clamp holder and the clamp retainer, as shown in Fig. 8-3. • Confirm that the clamper and the clamp retainer are not contacting one another (Fig. 8-4). • Press the TRACK FWD (▷▷|) and the PLAY (▷) keys sequentially to close the focus and spindle servos (do not close the tracking servo). • Insert a 4 kHz-cutoff low pass filter between the oscilloscope and TP1 Pins 2 (TRK.ERR) and 4 (GND) as shown in Fig. 8-6. and observe the waveform output by TP1 Pin 2 TRK.ERR (tracking error) on the oscilloscope.

Step No.	Oscilloscope Setting		Test Points	Adjusting Points	Check items/ Adjustement specifications	Adjustment procedure
	V	H				
	0.5V/div	5 msec/div	TP1 Pin 2 (TRK.ERR)	Grating adjustment screw Grating adjustment screw	Null point Max. amplitude	● Turn the grating adjustment screw with the ⊖ screwdriver to find the null point (see Photo 8-1.). ● Next, slowly rotate the screw counterclockwise and adjust to the point where the waveform (tracking error signal) first achieves its maximum amplitude (see Photo 8-3.). Note: Avoid applying pressure to the screwdriver while adjusting the screw. Doing so causes the pickup to move inward, making adjustment more difficult. ● Lastly, remove the low pass filter and confirm that the tracking error signal p-p voltage does not greatly vary when the pickup is moved to the inner-most and outer-most tracks of the disc. If the levels diverge by ±10%. or more re-adjust the maximum error amplitude point by rotating the grating adjustment screw.

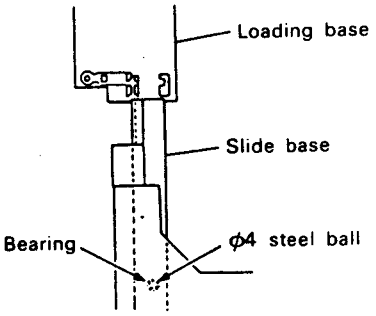


Fig. 8-7

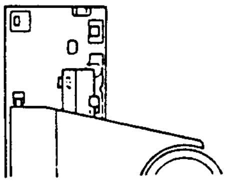


Fig. 8-8

Remount the disc tray according to the following procedure when the grating adjustment is complete.

1. Remove the disc and the spacer.
2. While lifting the clamp holder [marked Ⓑ in **Fig. 8-2.**] with the right hand, hold the tray in the left hand as indicated by Ⓒ and slide the slide base into the hard resin fittings on the loading base as shown in **Fig. 8-7.** to reinsert the disc tray.
   (At this time, be sure to hold the φ4 steel ball in place with the index finger of the left hand.)
   (Also, be careful that the front panel is not damaged by the bearing of the slide base at the φ4 steel ball section coming into contact with the panel.)
3. Insert the slide base so that it fits into the two hard resin fittings at the rear of the loading base (see Fig. 8-8.).
4. Insert the tray all the way.

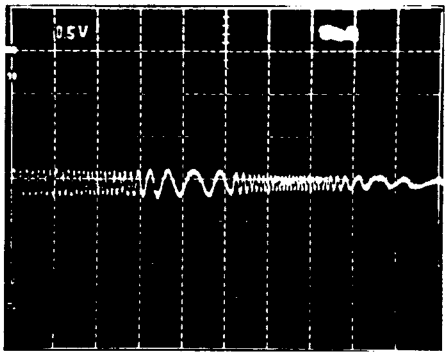


Photo 8-1 Null point

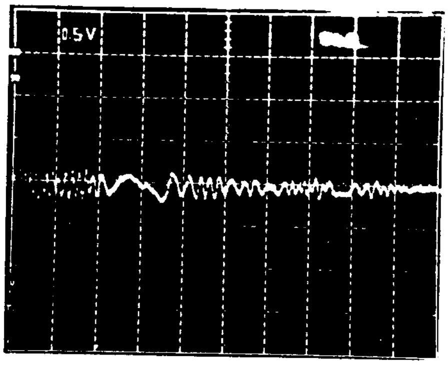


Photo 8-2 This is not the null-point waveform

⇩

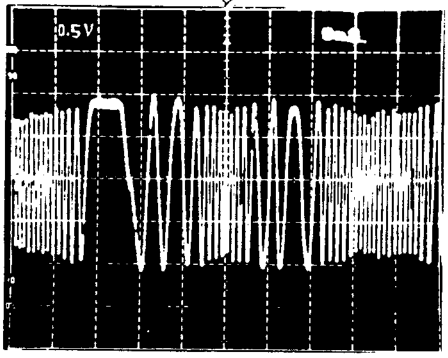
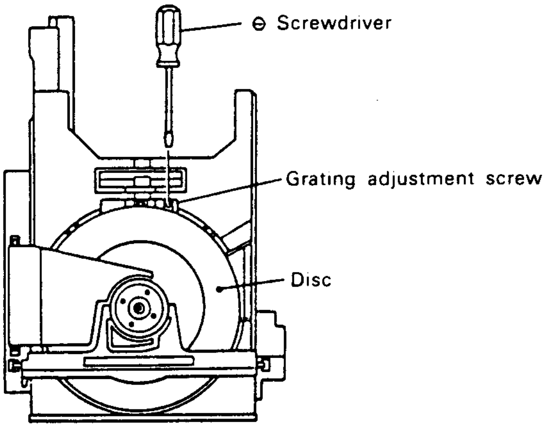
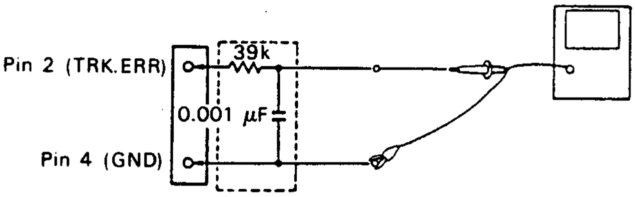
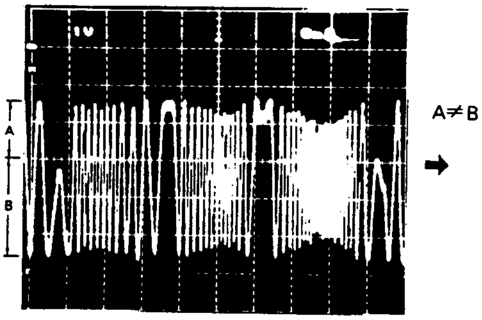
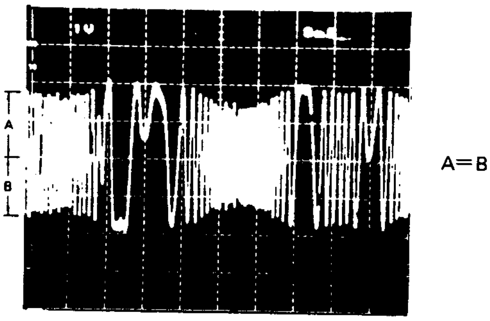
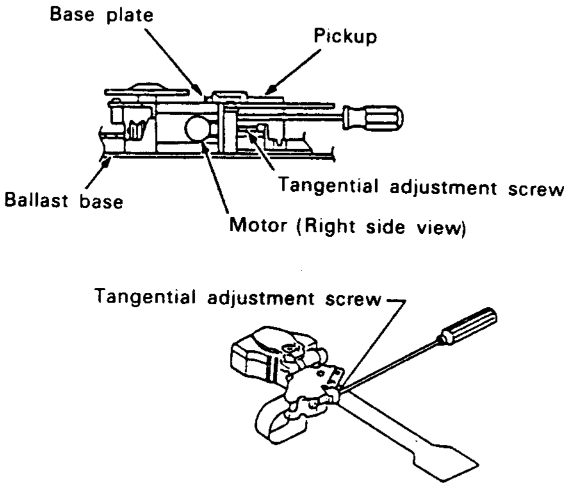
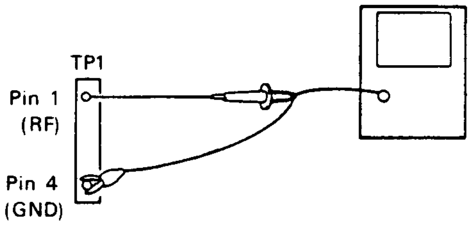


Photo 8-3 Maximum amplitude

Step No.	Oscilloscope Setting V	Oscilloscope Setting H	Test Points	Adjusting Points	Check items/ Adjustement specifications	Adjustment procedure
5	**Grating adjustment (2) (using discs with a recording time of 60 min. or more)**					
	 Fig. 8-9  Fig. 8-10					Note: This adjustment can only be performed with a disc having pits up to R115mm, not with the Test Disc (YEDS-7). ● Set the unit to test mode **(see page 32)**. ● Load the test disc, shift the pickup to the outer periphery so that the pickup grating adjustment hole is visible from the pit surface of the disc or from the hole in the servo mechanism **(see Fig. 8-10.)**. ● Press the TRACK FWD (▷▷|) and the PLAY (▷) keys in sequence to close the focus servo and spindle servo (do not close the tracking servo). ● Observe the waveform output by TP1 Pin 2 TRK.ERR (tracking error) on an oscilloscope, inserting a 4 kHz low-pass filter **(see Fig. 8-10.)**.
	0.5V/div	5 msec/div	TP1 Pin 2 (TRK.ERR)	Grating Grating	Null Point Maximum amplitude	● Insert a ⊖ screwdriver into the grating hole, turn and find the null point **(see Photo 8-1.)**. ● Next, slowly turn the ⊖ screwdriver counter-clockwise from the null point and adjust until the waveform (tracking error signal) reaches maximum amplitude **(see Photo 8-3.)**. Note: Use caution since inserting the ⊖ screwdriver forcefully will cause the pickup unit to float upward. ● Finally, confirm that there is no major fluctuation in the p-p voltage of the tracking error signal (do not insert the cutoff 4 kHz low-pass filter) when the pickup is shifted to the inner periphery and when the pickup is shifted to the outer periphery. If there is a difference of more than ±10% again rotate the grating adjustment screw and adjust the tracking error signal to maximum amplitude point.

Step No.	Oscilloscope Setting		Test Points	Adjusting Points	Check items/ Adjustement specifications	Adjustment procedure
	V	H				
6	**Tracking balance adjustment**					
	0.5V/div	5 msec/div	TP1 Pin 2 (TRK.ERR)	VR5 (TRK.BAL)		- Load the test disc. - Set the unit to test mode (see page 32). - Press the MANUAL SEARCH FWD (▷▷) key to position the pickup near the center of the disc. - Press the TRACK FWD (▷▷|) and PLAY (▷) keys sequentially to cause the disc to rotate. - Observe the waveform output by TP1 Pin 2 TRK.ERR (tracking error) on the oscilloscope and adjust VR5 TRK.BAL (tracking balance) so that the DC components are eliminated from the tracking error signal.
	 Photo 8-4 DC elements mixed in signal					 Photo 8-5 DC elements eliminated
7	**Tangential adjustment**					
	 Base plate Pickup Ballast base Tangential adjustment screw Motor (Right side view) Tangential adjustment screwFig. 8-11					- Set the unit to test mode (see page 32). - Open the tray and load the test disc. - Press the MANUAL SEARCH FWD (▷▷) key to position the pickup near the center of the disc. - Insert a hex wrench into the tangential adjustment screw section from the rear of the mechanism. - Close the tray. Note: An L-shaped hex wrench should not be used. Use one such as shown on the left. If an L-shaped hex wrench is to be used, the tray must be removed before performing adjustment (see page 35, 5. Grating Adjustment (1)). - Press the TRACK FWD (▷▷|), PLAY (▷), and PAUSE (▯▯) keys sequentially to close all the servos (the pause indicator will illuminate).

Step No.	Oscilloscope Setting		Test Points	Adjusting Points	Check items/ Adjustement specifications	Adjustment procedure
	V	H				
		200 nsec/div	TP1 Pin 1 (RF output)	Tangential adjustment screw	Sharpest possible eye pattern	● Observe the waveform output by TP1 Pin 1 (RF output) on the oscilloscope and adjust the tangential adjustment screw to achieve the sharpest possible eye pattern. ● The point to which the adjusting screw should be set lies about halfway between the points where the eye pattern becomes most blurred when the screw is rotated clockwise and counterclockwise. When the whole waveform becomes clear, concentrate on sharpening the fine lines forming the diamond at the center of the eye pattern (see Photo 8-8.). Adjust until the fine lines on all four sides of the diamond are both sharply defined and dense.  Fig. 8-12 Note: Use a hex wrench to raise the pickup somewhat while making this adjustment.

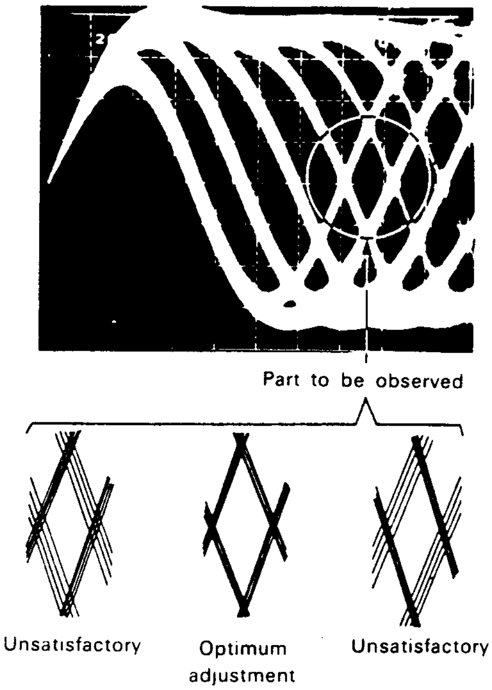

Part to be observed
Unsatisfactory
Optimum adjustment
Unsatisfactory

Photo 8-6

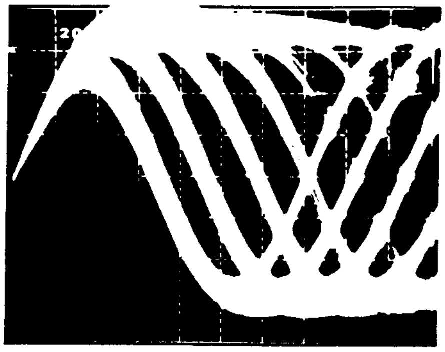


Photo 8-7

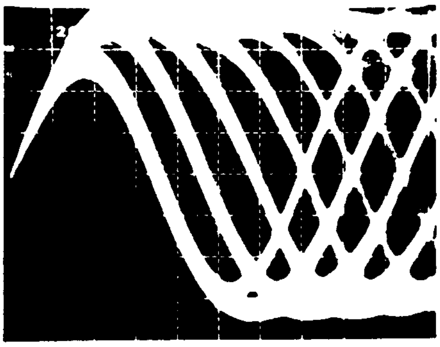


Photo 8-8

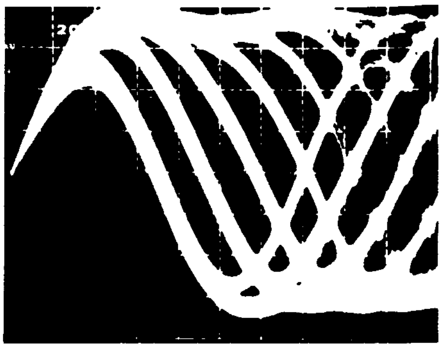
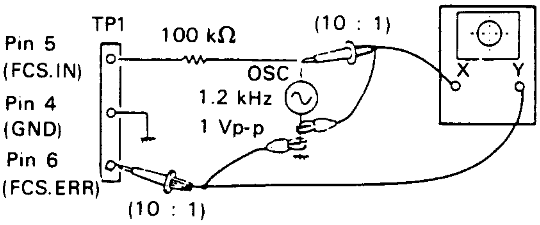
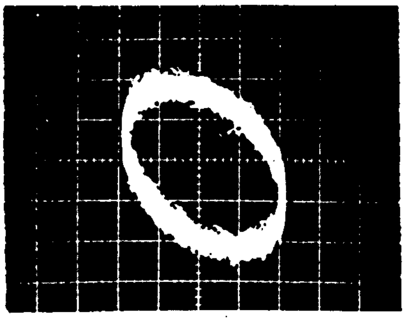
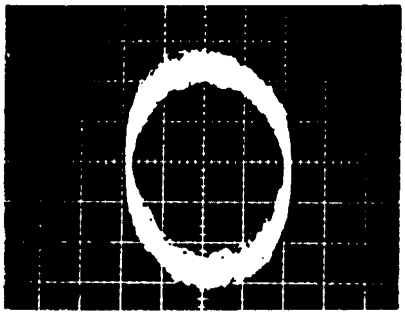


Photo 8-9

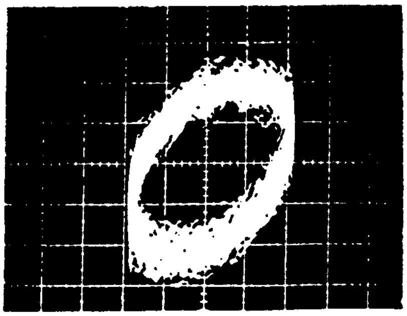
Step No.	Oscilloscope Setting		Test Points	Adjusting Points	Check items/ Adjustement specifications	Adjustment procedure
	V	H				
8	**Focus gain adjustment**					
	CH1(X), CH2(Y) 20 mV/div 5 mV/div (probe: 10:1)		X-axis TP1 Pin 5 (FCS. IN) Y-axis TP1 Pin 6 (FCS. ERR)	VR3 (FCS. GAN)	Phase difference of 90	- With the oscillator power turned OFF, connect the oscilloscope and oscillator as shown in Fig. 8-13. - Set the unit to test mode (see page 32). - Press the TRACK FWD (▷▷|), PLAY (▷) and PAUSE (⏸) keys sequentially to close the focus, spindle and tracking servos. - Turn ON the power to the oscillator and set it to output a 1.2 kHz 1 Vp-p signal. Note: Some oscillators discharge a DC voltage when turned on. It is therefore recommended that the oscillator be connected after it has been turned on. - Adjust VR3 FCS.GAN (focus gain) so that the Lissajous's figure becomes a horizontal circle on the oscilloscope (phase difference of 90°).  Pin 5 (FCS.IN) Pin 4 (GND) Pin 6 (FCS.ERR) TP1 100 kΩ (10 : 1) OSC 1.2 kHz 1 Vp-p X Y (10 : 1) Fig. 8-13



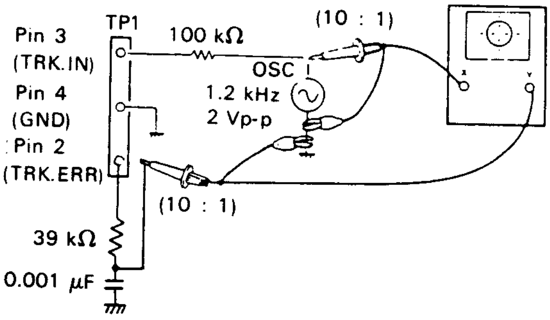
Gain overcompensated
Photo 8-10

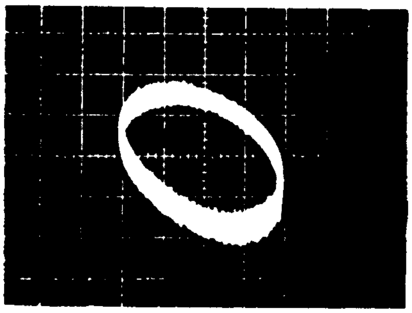


Gain optimal
Photo 8-11

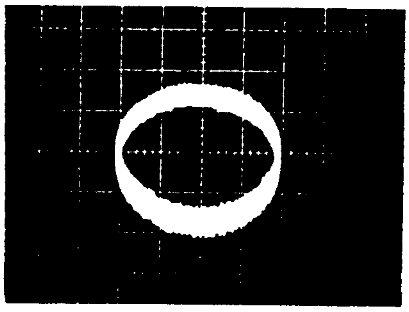


Gain undercompensated
Photo 8-12

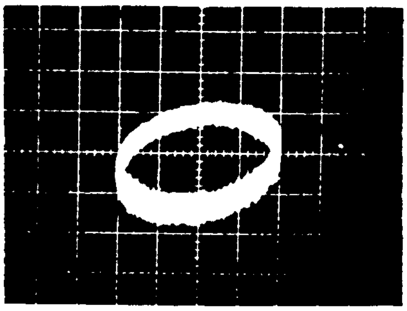
Step No.	Oscilloscope Setting		Test Points	Adjusting Points	Check items/ Adjustement specifications	Adjustment procedure
	V	H				
9	**Tracking gain adjustment**					
	CH1(X), CH2(Y) 50 mV/div, 5 mV/div (probe: 10:1)		X-axis TP1 Pin 3 (TRK.IN) Y-axis TP1 Pin 2 (TRK.OUT)	VR4 (TRK.GAN)	Phase difference of 90	• With the oscillator power turned OFF, connect the oscilloscope and oscillator as shown in Fig. 8-14. • Set the unit to test mode (see page 32). • Press the TRACK FWD (▷▷|), PLAY (▷) and PAUSE (❚❚) keys sequentially to close the focus, spindle and tracking servos. • Turn ON the power to the oscillator and set it to output a 1.2 kHz 2 Vp-p signal. Note: Some oscillators discharge a DC voltage when turned on. It is therefore recommended that the oscillator be connected after it has been turned on. • Adjust VR4 TRK.GAN (tracking gain) so that the Lissajous's figure becomes a horizontal circle on the oscilloscope (phase difference of 90°).  Pin 3 (TRK.IN) TP1 100 kΩ (10 : 1) OSC 1.2 kHz 2 Vp-p Pin 4 (GND) Pin 2 (TRK.ERR) (10 : 1) 39 kΩ 0.001 μF X Y **Fig. 8-14**



Gain overcompensated
Photo 8-13



Gain optimal
Photo 8-14



Gain undercompensated
Photo 8-15

Step No.	Oscilloscope Setting		Test Points	Adjusting Points	Check items/ Adjustement specifications	Adjustment procedure
	V	H				
10	**VCO free run frequency adjustment**					
			TP2 Pin 2	VR8 (VCO.ADJ)	4.275 ±0.025 MHz	• Set the unit to test mode (**see page 32**). • Short the ASY and GND jumper with a ⊖ screwdriver or similar tool (**see Fig. 8-15.**). • Connect a frequency counter capable of measuring frequencies of 10 MHz and above to TP2 Pin 2. • Adjust VR8 VCO.ADJ (VCO free run adjustment) so that the frequency counter reading becomes 4.275 ±0.025 MHz.
11	**Focus error check**					
			TP1 Pin 6 (FCS.ERR)			• Set the unit to test mode (**see page 32**). • Ground TP1 Pin 5 FCS.IN (focus in) to GND. • Observe the waveform output by TP1 Pin 6 FCS.ERR (focus error) when the TRACK FWD (⊳⊳|) key is pressed.

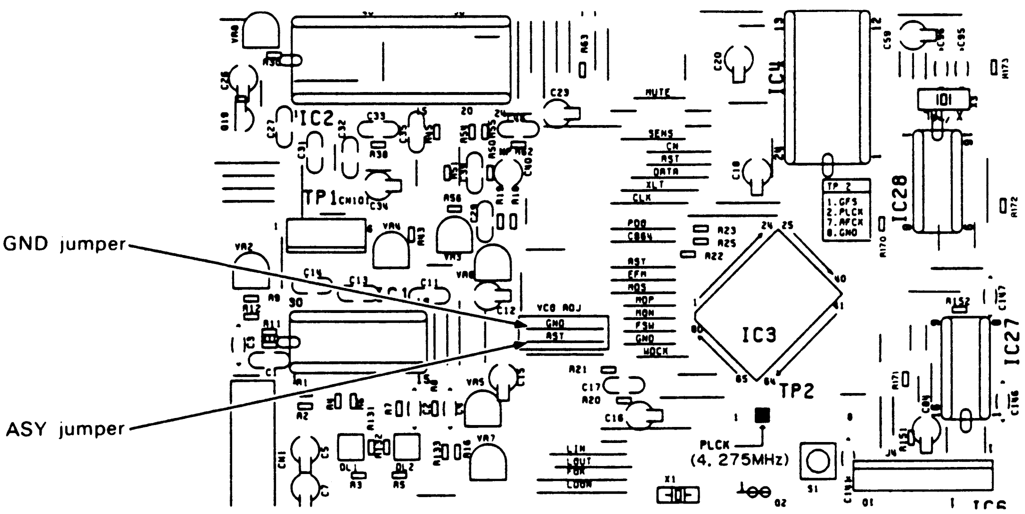
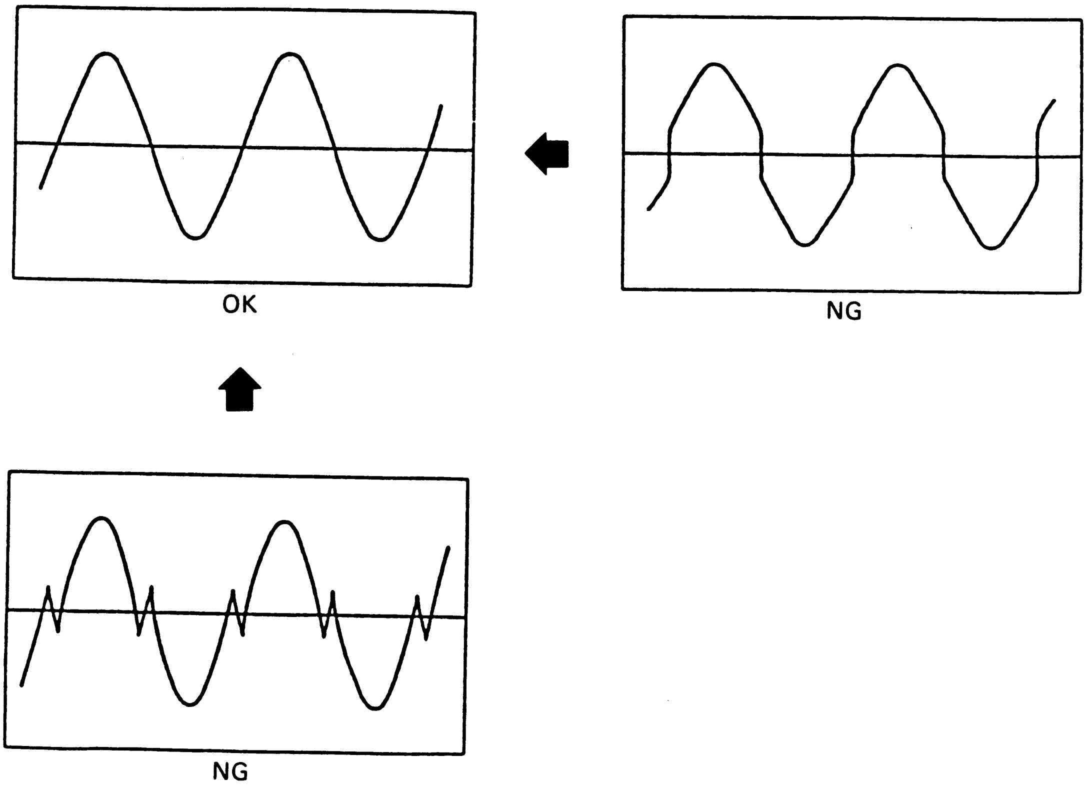


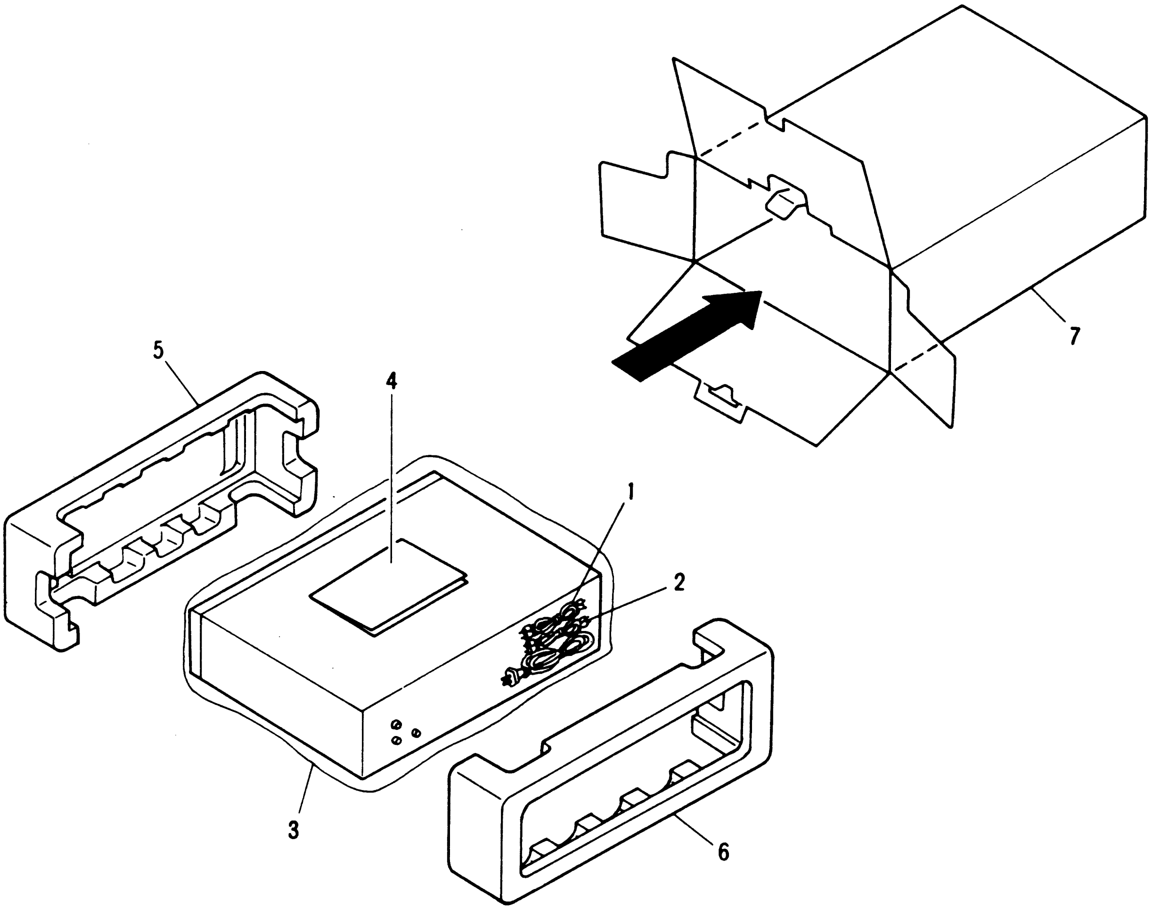
Fig. 8-15 Positions of ASY and GND jumpers

Step No.	Oscilloscope Setting		Test Points	Adjusting Points	Check items/ Adjustement specifications	Adjustment procedure
	V	H				
12	**MSB adjustment**					
	5mV/div	0.2 msec/div	JA1 LINE OUT terminal (Lch)	VR10	Sine wave	• Set the unit to normal play mode. (see page 32). • Play back the 20th track (−60 dB, 1 kHz, L/Rch) of the test disc (YEDS-7). Connect an oscilloscope to L ch of the LINE OUT terminals and observe the audio output waveform. • Adjust VR10 MSB.ADJ Lch (MSB adjust, right channel) so that the waveform on the oscilloscope becomes a sine wave.
			JA1 LINE OUT terminal (Rch)	VR9	Sine wave	• Perform the same adjustment for R-CH (VR9).

- **Zero cross distortion waveform**



9. PACKING



Parts List of Packing

Mark	No.	Part No.	Description
	1	PDE-319	Connection cord
	2	PDE1023	Connection cord
	3	Z23-007	Sheet
	4	PRE1047	Operating instructions
	5	PHA1070	Protector (F)
	6	PHA1071	Protector (R)
	7	PHG1185	CD packing case
	8	PHC1030	Spacer (with in the tray)

10. FOR HB TYPE

10.1 CONTRAST OF MISCELLANEOUS PARTS

NOTES:

Parts without part number cannot be supplied.

The ⚠ mark found on some component parts indicates the importance of the safety factor of the part. Therefore, when replacing, be sure to use parts of identical designation.

- *For your parts Stock Control, the fast moving items are indicated with the marks ★★ and ★.*

  ★★ GENERALLY MOVES FASTER THAN ★

  This classification shall be adjusted by each distributor because it depends on model number, temperature, humidity, etc.
- *Parts marked by "◉" are not always kept in stock. Their delivery time may be longer than usual or they may be unavailable.*

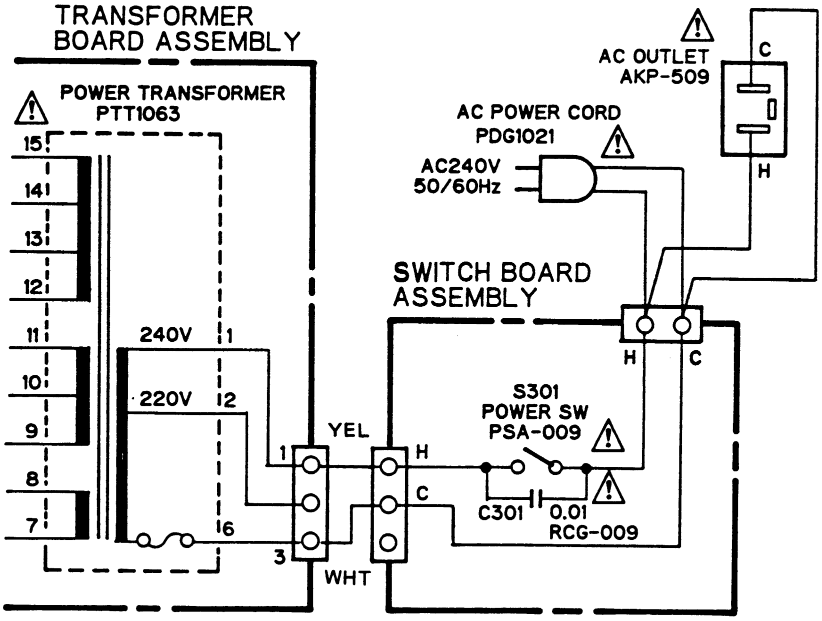
  Shipment is made with the caution card affixed to the glass door.

The PD-X540/HB type is the same as the PD-X540/HEM type with the exception of the following sections.

Mark	Symbol & Description	Part No.		Remarks
		PD-X540/HEM	PD-X540/HB	
⚠	1P AC outlet	AKP-508	AKP-509	
⚠	AC power cord	PDG1008	PDG1021	
	Operating instructions (English)	...	PRB1046	
	Operating instructions (English/French/Spanish/German/Italian/Swedish/Dutch/Portuguese)	PRE1047	...	
⚠ ★★	Fuse (T2A)	PEK-103	...	

10.2 SCHEMATIC DIAGRAM

- **For HB type**


TRANSFORMER BOARD ASSEMBLY
POWER TRANSFORMER
PTT1063
15
14
13
12
11
10
9
8
7
240V
220V
1
2
6
3
YEL
WHT
AC OUTLET
AKP-509
C
H
AC POWER CORD
PDG1021
AC240V
50/60Hz
SWITCH BOARD ASSEMBLY
H
C
S301
POWER SW
PSA-009
C301
0.01
RCG-009

Line Voltage Selection (for HEM and HB types)

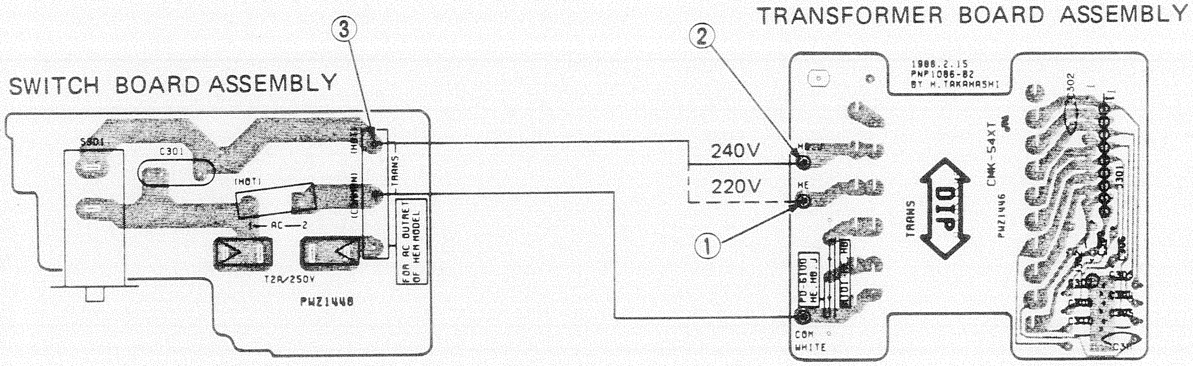
- Line voltage can be changed with the following steps.

1. Disconnect the AC power cord.
2. Remove the bonnet case.
3. Change the connection wire from Switch board assembly (Terminal NO. ③) to Transformer board assembly (Terminal NO. ① or ②) as follows.

Voltage	Terminal NO. of Transformer board assembly
220V	①
240V	②

4. Stick the line voltage label on the rear panel.

Part NO.	Description
AAX-193	220V label
AAX-192	240V label


TRANSFORMER BOARD ASSEMBLY
SWITCH BOARD ASSEMBLY
③
②
①
240V
220V
S501
C301
(HOT)
(COMMON)
TRANS
AC—2
T2A/250V
PWZ1448
FOR AC OUTLET OF HEM MODEL
1988.2.15
PNP1086-B2
BY H.TAKAHASHI
HE
COM
WHITE
PD-6100 HE,HB,J
TRANS
DIP
CMK-54XT
PWZ1446
C302
T1
C301